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COMPUTER
NEWS
THE COMPLETE COMPUTING WEEKLY
45p AUG 25-31 Vol 1 No 25

ELECTRON:
Will lightning strike twice for Acorn?

THIS WEEK

NEWBRAIN NAVIGATION
CP/M interfacing and memory mapping

SIMONS BASIC
We review Commodore's extended Basic for the 64

ORIC MONITOR
Three new packages to make machine code easy

ARCADE ACTION
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August 25-August 31, 1983 Volume 1 No 25

PULL-OUT
Micropaedia Commodore 64: Part 2

Translating programs from the Vic to the 64, the software, the Basic and machine code.

REGULARS

Cover photo by Pete Smith
Lightning photo courtesy Zefa

PCN SPECIALS

PCN PRO-TEST: HARDWARE

PCN PRO-TEST: SOFTWARE

PCN PRO-TEST: PERIPHERALS

GAMEPLAY

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Drive arrives

Dragon Data's official disk drives will be available next month through Boots, Dixons and other Dragon dealers.

The Dragon will take up to four disk drives. The drives are standard 40-track 5 ¼in jobs that store up to 184K on a single-sided, double-density disk. The first drive will cost £275 and include a disk controller, the second is only £225, the third goes for £225 while the fourth sells for £200.

The first drive with disk controller fits into the Dragon cartridge software slot and adds some extra commands to the Dragon's Basic. Some of the extra words included in the extended Basic are AUTO — for auto line-numbering, WAIT — as a form of PAUSE command to delay the execution of various commands, and several extensions to the error code messages.

The drive system is expanded easily because the first drive comes in a dual drive configuration, where the spot for the second drive is blank — so that when you do add the next drive it will just slot into the blank space.

Newbrain maker in trouble

Staff at Grundy Business Systems were given 24 hours' notice as the fate of the company was being decided earlier this week.

No official Grundy spokesman was available for comment as *PCN* went to press, but the staff were in no doubt that the manufacturer of the Newbrain was headed for liquidation.

'It has been on the cards for a while,' said one employee. 'We've expected to be on 24 hours' notice regularly since June.'

The extent of Grundy Business Systems' financial difficulties is not known. Staff were talking about massive debts. The company admitted earlier this summer that it would seek further financial backing, but at that time it said that the expansion brought about by the imminent release of CP/M Newbrains was the cause.

Prestel prices

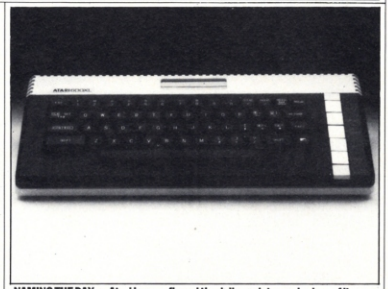
Home users of Prestel will not be charged for computer time if they use Prestel during the day on Bank Holiday Monday.

Prestel has confirmed that following its promise to *PCN* to review Bank Holiday charges (*PCN, issue 12*) it will not make the 5p a minute charge during 'business hours'.

However, Prestel says that this will be a one-off for this Bank Holiday.

Nevertheless, this should be good news for Prestel users who had found — until *PCN* took up cudgels on their behalf — that apart from the Christmas period they were being charged for computer time when they assumed that Bank Holidays would be treated in the same way as Sundays.

Prestel is aiming in the longer term to change its database software so that it can distinguish between home and business users.



NAMING THE DAY — Atari has confirmed the delivery dates and prices of its new XL series of machines. The 16K 600XL (shown above) will be released next month and sell for £149, while the 64K 800XL will sell for even less that we suggested last week. Priced at £249, it will be in a good position to challenge the recently slashed £225 Commodore 64. The 600XL will be ungradable to the 64K capacity of the 800XL, although Atari has not yet released the price of those upgrades.

Apple clone is Toad

By David Guest

The UK will soon have its first home-grown Apple look-alike. It's called the Toad, and it has been born out of a micro user's frustrations.

Toad Computers is aiming to show that you don't have to come from South East Asia to take on the US giants, and that you don't need years in the business to produce a sensible system.

Its first system comes in two versions. The desktop model is virtually identical to an Apple; it has a U-Micro motherboard with 64K and a Franklin-style keyboard and will cost £599. The deskbound model is incorporated into a desk along with peripherals and storage space — this will cost £2,779.

A portable in a briefcase is planned for early next year.

Toad expects to avoid any trouble with Apple (*PCN, issue 23*) by selling a unit into which you'll have to plug proprietary products such as Integer Basic or other Applesoft offerings; this may generate some business for Apple, but Toad intends to have extra processor cards of its own to increase your range of options.

The unit is designed to be as British as possible — the motherboard, the keyboard, and the disks (from Rodime in Scotland) are all UK products. It will be assembled in England, initially in quantities of 250 a month.

The Toad should be officially launched in three weeks' time. The name is supposed to stand for Total Organised Analysed Data systems but the acronym seems likely to outlive the explanation.

The background to the Toad lies in an engineering company that had been using an Apple system and set about adapting it to improve some of the features which, as an end-user, it found unsatisfactory or inconvenient. Clients of the company expressed interest in the system and it became a marketable commodity.

Toad Systems hopes to win Government financing for its first products and for future development - this is likely to include a 68000 board, a 6809E card, and an interface to a 3½in 10Mb Winchester disk.

IBM soon to be Peanut vendor?

Watch out. IBM's portable Peanut is on its way and could be launched in the US within the next few weeks.

Informed speculation suggests that the machine will, like the PC, come with a detached keyboard. The monitor will be an optional extra as the Peanut is designed to work with a domestic TV.

It will probably use the Intel 8088 chip to make sure that the micro fits in with IBM's policy of compatibility between personal computer products. There will be 64K of RAM (upgradeable to 128K) and a single disk drive.

Unlike the PC, the Peanut will offer colour graphics as a standard feature.

Overall the design of the Peanut is said to be lightweight, compact and portable.

It is expected that the basic machine will cost between $700 and $800 with a complete system, including colour monitor, costing around $1,300.

Given the pricing policy on the PC, this suggests that a £1 per $1 conversion could be applied to Peanut sales in the UK.

IBM has clearly learnt a lot from the launch of the PC, and it should be safe to assume that we won't have to wait 18 months for the Peanut. The dealer network is already in place and production of PCs at IBM's Greenock factory is into top gear.

The suggestion in the US is that IBM will be able to ship around 90,000 Peanuts by Christmas. This is hardly likely to satisfy public demand.

With IBM both here and in the US adopting its usual 'no comment on products that have not been announced' attitude a precise picture is difficult to piece together.

But even IBM has to have dealings with outside companies before an official launch to sort out supplies of components, sub-contracted manufacture and development of software.

Normally, these arrangements are covered by tight non-disclosure clauses in contracts. Even so, tiny rips are beginning to appear in the tightly drawn veil of secrecy and IBM-watchers are confidently predicting that something big is about to happen.

So strong is the speculation that other companies have seen their share prices drop, as rumours swept around the Wall Street stock exchange that an official announcement will be made by IBM in September or by the middle of October at the latest.

So expect to see the Peanut launched in the new year in this country. March was the chosen month for launching the PC earlier this year.

Ten win in big race

David Johns and LSI minders

ENTRY NUMBER	MANUFACTURER	NO OF PASSES OF PROGRAM	NUMBER OF BREAKDOWNS	MAXIMUM TEMP. INSIDE MACHINE	MINIMUM TEMP. INSIDE MACHINE
1	LSI M4	980	0	33C	30C
2	LSI M4	967	2	33C	32C
3	IBM PC	127	74	40C	38C
4	IBM PC	0	2	—	—
5	COMART CP1000	96	3	30C	29C
6	SAMURAI	277	0	33C	29C
7	SAMURAI	277	0	35C	29C
8	OLIVETTI M20	141	0	40C	30C
9	OLIVETTI M20	142	0	36C	30C
10	WANG PC	1192	10	31C	29C
11	WANG PC	1191	0	30C	28C

LONDON COMPUTER MARATHON — SUMMARY OF RESULTS

By David Guest

In the best Olympic spirit the runners in the first London Computer Marathon crossed the finishing line together.

After seven days and nights of more or less continuous processing the two Wang entries came out ahead for speed. But the Marathon was testing more than one feature of the systems, and a winner won't be announced until the two judges, *PCN's* Richard King and *Which Computer's* Colin Barker, have examined the overall performances of the machines.

Perhaps the most remarkable result of the marathon is that ten of the 11 machines that started on August 10 stayed the distance. Six of them, the two Samurai S16s, the two Olivetti M20s, one of the Wang Professionals and one of the LSI M-Fours, didn't so much as stumble.

One of the IBM PCs entered by an IBM dealer, Spartex Micro, limped out of the race soon after the start when a microswitch in one of the disk drives failed. The other completed the course suffering from what appeared to be a programming error that caused it to stop after every two passes of the test program.

The other machines (a Comart Communicator, a second Wang and a second LSI) all got round with no more than minor hiccups, watched over by a team of scrutineers from computer studies degree courses.

The original marathon runner unfortunately dropped dead after his historic and trend-setting run, but the ten micros finished the race in good form and cooled down under aluminium foil to save them from catching a chill. In the absence of a winner, all the companies involved were awarded certificates to commemorate the event.

They all declared themselves well pleased with it, particularly Micro

John Lamb and Comart's Communicator.

Networks, which issued the challenge in the first place and stood to lose most face if its Samurais hadn't performed. Comart's John Lamb suggested that the apparently pedestrian performance of his Communicator could be explained by the manner in which it accesses disks, but he added that the test had given the company something to

Jay Horwitz with the Samurai.

think about and that it would look closely at the machine as a result.

Nobody cared to speculate publicly on why the Wangs and the LSIs had covered so much more ground than the rest. The test software was particularly heavy on disk accesses, and one of the features that the judges will look at is the way in which it was implemented.

The marathon could now become an annual event, though its organisation may have to change before other micro makers will take part. This year Micro Networks invited all the manufacturers of 16 and pseudo 16-bit systems sold in the UK to enter a machine; those which declined did so for various reasons.

One, Sanyo, had to back out at the last minute when a container-load of its systems was stolen, leaving the Samurai as the only Japanese-built machine in the race. ACT was invited to enter a Sirius but did not 'because the event wasn't organised independently'.

Micro Networks has said that it intends to sponsor a marathon again next year, but the ACT spokesman said that his company's reservations would still apply unless the event was organised independently.

The presence of an IBM PC on the starting line was a bonus for the first marathon, but IBM itself had decided against entering a machine and it will not commit itself on any future marathon. 'We are not keen to participate in other suppliers' promotional activities,' said a spokesman.

Wang's Professional pace-maker . . .

. . . and Olivetti's Dermot Hill.

Cheers . . . the scrutineers take a break.

VIEW FROM JAPAN

Big business joins the micro clubnet

From Serge Powell

If you've ever noticed how Japanese tourists in foreign parts like to go places in highly structured groups maybe you can appreciate what makes the Japanese Microcomputer Club so typically Japanese.

To start with it has 9,000 members and some 30 branches scattered throughout Japan. Almost as impressive are the numbers and the credentials of its directors — a cursory scan of the list reveals that they have been drawn from the elite of Japanese universities and the cream of Japan's hi-tech manufacturers, with some recruits from Government agencies thrown in for good measure.

It is all under the guidance of the Japanese Electronics Industry Development Association (JEIDA), and the roll-call of corporate members and participants includes such familiar names as Epson, Hitachi, Mitsubishi, Toshiba and Nippon Electric (NEC).

This consensus among rival manufacturers has presumably helped the organisation achieve its goals of 'prompting the popularisation of microcomputers and the technical advancement among members independently of any enterprise'. It has also given the organisation an enviable credibility.

Just as such venerable Japanese institutions as schools of flower arranging, martial arts societies, and practitioners of tea ceremonies assign to their members ranks based on years of experience and comparative expertise, the Japanese Microcomputer Club has established a grading system for its members starting at 'efficient manipulation of a personal computer' (all translations kindly provided by the club) and ranging up to 'top-level experience over five years'. It may not be long before black belts are awarded to particularly adept and well-qualified members — because that is what it's all about.

For those whose interests are at the novice level the organisation also operates a centre in Tokyo's fashionable Ginza district. Here club members can sample the latest offerings of Japan's hardware manufacturers without the distractions of anxious salesmen hovering nearby pushing for a signature on the dotted line. The centre's inaugural event was a show of hand-held and pocket computers — of which more in future columns, God and the editor willing. In typically Japanese fashion the event was called the Cute Computer Fair.

Another recent project was the evaluation of the innumerable books on personal computing that are flooding Japan at the moment. Besides being the world's most imitative country, Japan has a very high level of literacy and of computer awareness — there must be a correlation and the publishers are rushing in. In a subsequent publication a list of 100 books was classified according to basic subject matter and user levels — and these were only the best of them.

Ongoing club projects include regular weekly seminars, and during the summer there are weekend retreats at which parents and children sit side by side, the adults at their Sharp or Fujitsu systems and the children at less powerful NEC PC6000 or Hitachi Basic Master Junior systems. At these sessions family members spend time together in the scenic tranquility of Mount Fuji, or at a number of other beauty spots.

For those who master the fundamentals offered at these and other courses the club's ultimate challenge is an annual national microcomputer contest. This observes regional rivalries by taking place in two parallel sessions in Tokyo and Osaka simultaneously. There are prizes in three categories: technical; conceptual (for ideas merchants); and one we can all profitably emulate — hard work. And just to complicate matters entries are submitted under a different theme each year. This year's was 'Animation, application to office automation, and intelligent microcomputer robots' (and I'm still trying to master my spreadsheet).

The Japanese Microcomputer Club is also interested in associating itself with similar groups overseas.

The club's address is: The Japanese Microcomputer Club, c/o The Japanese Electronics Industry Development Assoc, 313 3-5-8 Shibakoen, Minato-Ku, Tokyo 105, Japan.

Genie's new connections

The Colour Genie has now got a Wizard as a partner. It's a disk interface, real-time clock and printer port costing just £114.

The interface is manufactured by General Northern Microcomputers (0783 860314) and will for the first time allow you to add up to four disk drives to your machine.

The company is also releasing a disk operating system called Micro-Dos to use with the interface at a cost of £40.

The DOS allows the use of single-sided disk drives with up to 96 tracks per side and 48 files per disk. The company is hoping in the near future to add an extension to the DOS to allow the use of double-sided drives.

If you buy your disk drives from GNM it will throw in MicroDos free.

The interface comes in a metal box with a lead that plugs into the cartridge port of the Colour Genie. There are two gold-plated edge connectors that protrude from the box. One is used for the disk drive and the other allows you to connect any Centronics-compatible printer.

Together with the DOS, GNM is offering a disk-based Basic together with a disk-based Forth, available at an additional cost.

The Wizard interface and Micro-Dos are available from General Northern Microcomputers direct or from Colour Genie dealers.

The interface is based on the company's DP1000 disk interface for the Video Genie. The company says that most disk-based software written for the Video Genie (including machine code programs) should be easily transportable to the Colour Genie using the Wizard.

Quick-draw loader for the Spectrum

JRS Software, which introduced fast loading for the ZX81 in May (*PCN*, issue 12), has now made this technique available on the Spectrum.

It comes in two versions: one, according to the company, loads at 2½ times the normal speed and will save the 48K Spectrum's entire memory in two minutes instead of the usual four and three-quarters — this costs £6.50 and comes on cassette. The second type will be implemented on JRS home-grown software, which sells for around £4.95, and duplications of JRS software done by distributors Downsoft for international distribution will also have this facility.

The company has also brought out a Spectrum Graphics Toolkit at £5.50 which gives a set of screen routines and provides pixel and character scrolling as well as pattern-drawing routines in Basic. Included is a demonstration program plus instructions which enables you to draw pictures.

JRS Software is in Worthing, Sussex on 0903 65691.

Wynd-Up's newsagent micro drive

Another firm with its roots in records has followed Virgin and K-Tel into the computer business and set itself up to sell systems.

Wynd-Up, based in Manchester, aims to get systems and software into your local newsagent's. Its plans go well beyond those of such companies as Virgin and K-Tel, which are concentrating on software — Wynd-Up will distribute systems, software and peripherals, and if all goes well it will sell them through a wider range of shops.

Initially the company started selling Spectrums and software to run on the machine, but with the market expanding so rapidly it decided to expand its range of machines.

David Crosweller, development manager for the set-up, said: 'We will be selling Orics, BBCs and Vic 20s to shops. One of our biggest outlets will be NSS Newsagents, which has 500 shops in the UK.'

Wynd-Up's David Crosweller.

First deliveries of software and hardware have already been dispatched.

Lok up your software

By David Guest

Software pirates are about to come under attack from a US company that claims to have solved the problem once and for all.

The Vault Corporation's Prolok device will let you back-up software but it won't let anybody else's machine execute a copy. And the approach it uses may not be impregnable, but since each Prolok disk has a unique signature it won't be any use to crack one.

Vault's senior vice-president, Dixon Smith, introduced Prolok in Europe last week. He describes it as 'diskware' rather than hardware or software, since what you as a buyer of software will see is a specially treated disk with the Prolok signature written into a form of disk-based ROM.

'Everybody wins — except the pirate,' said Mr Smith. To implement Prolok on a piece of mass-produced software might cost as little as 75 cents, but this can be offset against the fact that 'the publisher (of software) has at the moment to write into his price the cost of the four copies that are stolen,' he added.

Vault says that Prolok meets all the criteria for a solution demanded by the US computer services organisation Adapso. It currently works on floppies under CP/M, MSDOS, Apple-DOS, CP/M-86 and Atari operating systems. More operating systems are to be added and a hard disk-based version is in the pipeline.

At the heart of the system is the fact that a copy will not run without the original version in another drive. This will make running an illegal copy a cumbersome business, but the nature of the original version (according to Vault, which is coy about this) means that a legitimate user will have no problem.

Stateside users snub the Timex-Sinclair Micro

Sinclair's Spectrum and ZX81 may be riding high in the UK sales charts but their colonial cousins in North America, the Timex Sinclair range of micros, are running into major sales resistance.

The machines are manufactured under licence from Sinclair and differ in several respects to Sinclair's own machines (*PCN issue 21*).

The Timex TS1000, the American version of the ZX81, was an instant hit when it was launched last year for $100. This year, following a price war, the machine no longer holds its attractions it once had.

With its limited memory, monochrome display and membrane keyboard it is considered yesterday's technology when compared with the Vic 20 and TI99/4A micros which come with colour graphics and typewriter-style keyboards and which now both sell for around $90.

Timex's response was to cut the price of the TS1000 to $49 but is still finding the going tough.

The new models to be launched this month, the TS1500 and the TS2000, are an attempt to get back into the running but it looks like an uphill task.

The TS1500 is basically a TS1000 with extra memory and a Spectrum style 'dead flesh' keyboard and will sell for $80. It will undercut the Vic and TI machines by only $10 and it still lacks the proper keyboard and colour graphics that the discerning American users have come to expect as standard features.

The TS2000, based on the Spectrum, will at least have the colour display but it still uses the Spectrum style keyboard. The $200 price tag for the 48K version is identical to that of the Commodore 64 and you don't have to be an industry analyst to predict which micro the users will go for.

All this could be bad news for Sinclair as it earns a five per cent royalty on every Timex machine sold. Fewer micros sold means less money for Sinclair.

Hero puts Maplin on the map

Heath's Hero robot cut the tape at Maplin's Manchester store.

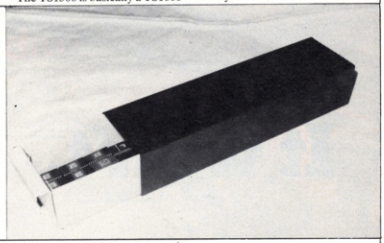
With sales of home computers forecast to double to £300m this year, and most action taking place in the High Street stores, Maplin Electronics has opened a micro supermarket in Manchester.

The new store, claimed to be one of the first micro self-service centres in Europe, has a large demonstration area where Atari, BBC, Commodore, Dragon and Spectrum micros can be put through their paces, together with a large range of software.

The opening was assisted by Hero, a walking, talking and sensing training robot. The highly user-friendly Hero is at present only available in a kit form and despite the price of £1,600 Maplin reports that it is not just the research labs and training colleges which are ordering, but keen individuals.

Speaking at the opening, Eric Howe of the National Computing Centre welcomed the presence in the UK of Hero. The coming generation, he noted, had to get to grips with robots and the training kit approach would assist the cause.

IT'S A RUB-OUT — There was a time not so long ago when any mention of EPROM blowers, copiers and erasers seemed to belong to the world of the big micro makers. But an indication of the way the wind is blowing comes from JP Designs, which has released an EPROM Eraser 'for use in the laboratory, classroom, and by the hobbyist'. There are three versions: one that holds 20 chips, one for 40, and the third again for 40 but equipped with a timer to ensure that you don't over expose the devices. The cost rises from £31.25 to £54.95. JP Designs is on Cambridge 0223 322234.



ZX merry-go-round

ZX Microfairs are becoming a regular event on the London calendar. The scene of the latest gathering was the Ally Pally in North London on Saturday.

The Alexandra Palace is not the best place to hold such a gathering — especially in the present London heat. For those unfamiliar with the place, the activities and exhibitions are held in a large plastic structure resembling an aircraft hangar at the back of the complex by the boat pond.

Air conditioning is not one of the hall's strong points, but by way of recompense there are a couple of bars around the perimeter (could be a plot to make more money).

The fair itself was the traditional ZX affair. Judging by the lack of parking spaces — motorist arriving after about 3pm were in for a long walk — the event is as popular as ever.

Mercifully, the plastic hall was large enough to give everybody a place to stand, unlike some of the previous efforts where you felt you were standing in a large but crowded lift.

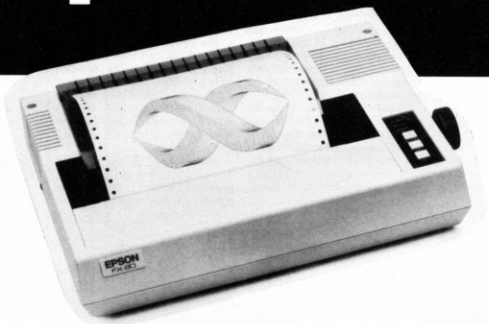
Inevitably, the Microfair has become a means for software and add-on vendors to make money. Remember the people who used to sell things at carnivals? A lot of them seem to have moved into the ZX market — there is a definite 'roll up, roll up' feel to some of the stands.

There were some highlights. An interesting micro-assisted war game was being demonstrated, but overall the stands had a street-market feel.

It would be nice to see less of the hard sell, more imaginative displays and more clubs and non-commerical activities. If there are to be many more Microfairs it may be time the organisers took their public into account.

For the time being the long-suffering public may have the patience to put up with the Microfair's rampant commercialism, but fairs are supposed to be enjoyable.

There are some people who think that if a Printer looks like an Epson, it will perform like one.



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RML links in disks

Several micro makers have hit problems trying to get their disk drives ready on time. But Research Machines (RML), an old hand at this game, has just released new drives for the Link 480Z.

The units are available with either single or dual drives, and contain an intelligent disk controller plus power supply. The disk controller has its own processor, which takes care of the different modes of operation. In double-density mode, a single drive system has a capacity of 328K of storage, and a dual drive system offers 656K.

Running CP/M 2.2, the drives are also compatible with Research Machines' 380Z systems. Therefore disk-based software that's available for the 380Z will be available for the Link 480Z.

The Link 480Z is one of the three micros which has received government approval for use in schools. With this in mind RML is offering a Typical Education Price (TEP) to schools and colleges, which means a 20 per cent discount.

For £725 you can buy a single disk drive, and £1,087 gets you the dual drive unit.

For further details contact RML on 0272-211823.

Research Machine's Link 480Z with extra storage on disks.

Games sets

More fun and games are on the way with a bunch of new software releases for the BBC, Spectrum, Atari VCS and Oric machines.

Express Software (021 622 3103) has made a pitch at the Oric machine with five new packages. Selling at £5.99 each, they are Monte Carlo Rally, Space Quest, Bandit, Breakout and Brad Rescues the Professor, which is the first in a series of character games.

Activision (0628 32839), which has produced some good zapping games for the Atari machines, has three games lined up for the Atari VCS.

Oink is based on the story of the three little pigs. But in this version they have a chance to rebuild their house as the wolf huffs and puffs.

Constant brushing with toothpaste is the only way to play Plaque Attack. In this game you have to fight decay off in 35 seconds and bonus points are awarded for each tooth saved.

If you like playing cops and robbers then Keystone Kapers will be the game for you. In 1920s-style crimebuster Kelly has to catch Harry the Hooligan and bring him to justice. All three packages are £29.95 each.

Dk'Tronics (0799 26350) has unveiled some entertaining stuff for the Spectrum. At £6.95 you can buy Maziacs and Dictator and at £4.95 Hard Cheese and Matrix. For the Beeb there's Proteanse at £6.95.

If you want to boost the sound of your Spectrum games plug in the Spectra-Sound Unit at £9.95. The unit will send sound from games directly to your TV speaker, where you can control the volume with the TV knob.

Wolf at the door in Oink.

IBM back-up and board

An IBM tape backup system, concurrent PCDOS, a spreadsheet/financial planner and an intelligent duplexer are among products due out from Dataflex, UK distributor for US company Ferox International.

The Dataflex IBM tape backup system, a portable 10lbs, will be out next month for £690. Its exchangeable cartridges each hold 20Mb of data.

Director David Low says it will take four minutes to copy the contents of your Winchester on to the unit.

Also in September Dataflex is making concurrent PCDOS (*PCN, Issue 23*) available on its IBM expansion boards, and the company may also do the same on boards for the Sirius.

Concurrent PCDOS will come on disk for about £12.50.

Apple IIe expansion on the cards

Three new expansion cards for the Apple IIe are out from Cirtech.

The standard 80 column card is £57.50, while the 16K card with 80 column display and 650 × 192 graphics (twice the precision of the Apple IIe) is £86.25.

The 64K version at £103.50 gives 80 column display and graphics as well as increasing the micro's memory to 128K.

The first two cards are upgradeable to 64K, as the same basic card is used in all three cases, with different components being added. Marketing manger John Robertson says the company will fit the upgrades for a fee of about £2 — alternatively, they will provide upgrade kits.

Cirtech is also selling an Eprom programmer card for the Apple II or IIe. This programs all Intel compatible Eproms up to a maximum capacity of 32K, and comes in two parts. One locks into the computer and the other is external, attached to a cable.

Cirtech is in Dunfermline, Scotland on 0383-72770, and products are available only by mail order.

TV NEWS — As you will have heard, there's an information revolution going on. Viewdata is just one of the revolution's spearheads, bringing allegedly up-to-the-minute news into your living room. But a new television set from Philips, with a built-in printer to give you hard copy output of a teletex page, looks like a backward step — some people clearly still prefer to read the news in printed form. The Philips CS3890 is a 26in colour set which costs £699.

Games by cable

High Street giant WH Smith has spread its wings and will be downloading a range of video games into living rooms through cable television next year.

Any user who signs up for the service will get a console called The Window, which has 64K of RAM and a full keyboard. Initially the games will be played from the console's memory, but eventually two-way cable systems will allow users to play sophisticated games on a host minicomputer operated by WH Smith.

Software will be provided by a Los Angeles company called The Games Network. In a deal with Smith it will ship arcade and educational games from its library.

Initially subscribers will have a choice of 20 games, with some games being deleted and new ones introduced each month. 'We are catering for children and adults,' said a spokesman from Smith. 'Eventually we hope that the service will encourage people to originate games over here, so we would have a UK supply to offer.'

Smith says that it's too early to give a price, but depending on negotiations with individual cable operators it would hope the system would be available next summer.

'We have been approached to do teleshopping and offer a Yellow Pages type of service. But we'll have to wait and see what avenues we will go into,' the spokesman said.

BBC nine day wonder

The BBC is stepping up its involvement in home hi-tech by staging its first Home Entertainment Spectacular next month.

During the nine-day event visitors will be able to use and learn about such things as teletext, viewdata, video games and home computers. In addition some new products will be unveiled at the show.

Some of the big names in the micro industry will be there — Acorn, Atari, Computer Games, and Casio. The newly formed Elan Computers will make its first public appearance with its new computer and Sinclair will be unveiling an unspecified new product. It will also be a major event for Mattel which will be holding the final of its country-wide Games Championship.

The BBC itself has plenty lined up for visitors. During the nine days there will be live broadcasts from Radio 1, Radio 2 and Radio 4 programmes. You will be able to see some of the Beeb's 'stars' and join in some of the entertainments that are planned.

You could even become a star yourself, as cameras will be there filming the action. Several companies are putting on shows where the audience can participate.

The Spectacular takes place at Olympia in London on September 17-25.

Doors open at 11.30am each day except September 19 when they open at 5pm and close at 9pm. Admission is £3 for adults and £2 for children under 12.

CHECKMATE — Multimate is a package that can give stand-alone word processing power to your IBM PC. Selling at £401.35 it is said to give fast screen response, and when you're working on a document it's not necessary to remember a series of keystrokes to accomplish common text manipulation functions. See-through colour coded adhesive labels are provided to spot function keys quickly. In addition, the system also has the facility of task selection by menu. Contact Pete & Pam on 01-769 1022.

Ffoss writes

A Slough company that sounds as though it has a speech impediment has gone into word-processing for Epson HX20 users.

Ffoss has launched Ffosswriter for the standard or expanded versions of the HX20. The software comes on cassette with a plug-in EPROM which gives the tape drive a random access facility, so that as far as the user is concerned he or she could be using a slow disk.

Ffosswriter comes in two 14K units so that you can load it into the standard HX20 one part at a time. Its main facilities are document handling, editing, word-processing functions and page layout. By word wrapping it uses lines of 80 characters on the Epson's 20 character, four line screen; display adaptor software to let you use a monitor is in the pipeline.

Ffosswriter comes with a 50-page A5 user manual, a reference card, and an overlay for function keys.

Ffoss is a two-year old company that has concentrated on research and development until now. Ffosswriter, costing £110, is the first of the products that it will market itself.

The company is on Slough 820277.

HP plugs in

HP-75C and one of the cartridges — three can be installed at once.

Plug-in ROM-based applications software seems to be a firm(ware) favourite at the moment. Hewlett-Packard has just announced a suite of plug-in read-only memories for the HP-75C.

People looking for economy needn't get too excited though — HP has never been known for a bargain-basement approach to pricing.

The individual cartridges range in price from £78 up to £224. They comprise a Visicalc package which is claimed to provide functions for standard spreadsheet problems, with routines specific to portable applications — tasks like travel expense reports and sales transactions that the average jet-setting HP-75 owner is likely to require. This one can also be used with a 9 or 12in screen and sells for £160.52.

The Math Pac is said to solve complex maths problems that require both speed and accuracy. You can execute the functions from the keyboard in calculator mode or use the keywords to develop routines for advanced maths functions. All this for £119.36.

There is a Text Formatter Pac for quick production of short letters and memos. Many of the standard WP functions are present, including indented paragraphs, centring and right justifying. It also has a distribution list option for generating form letters. The Formatter costs £78.20.

The Royal Hunt of the Bug

Coinciding with the grouse season bug-hunting is in full swing — but bugs are thin on the ground this year.

Pegasus, one of the software producers that offers rewards to people who find faults in its programs, reports that it has paid out only eight times so far this year. Each bug is worth £50 to the finder.

But the prospects for bounty hunters could improve in the near future — Pegasus is extending the range of systems on which its suite of business systems will run. The DEC Rainbow is next in line, and it is due to be followed by Texas Instruments' Professional, NCR's Decision Mate V, and ACT's Apricot.

Pegasus' next move is likely to be to include Wang and Hewlett-Packard among the machines that its range will run on. It is also extending the range — sales order processing and job costing have been added recently.

Pegasus is on 0536 522822.

EPSON AFLOAT — Yachtsman Tony Whittaker, seen here clutching his HX20, has written a coastal navigation program for it. The micro needs a 16K RAM pack in order to run the 18K program, which Tony may sell to other yachting enthusiasts. The HX20 itself does not apparently suffer from seasickness. 'It's come through its sea trials with flying colours,' said its owner. Further information from Tony on 06474 272.

PCN Charts

You've followed the micro charts — now here's the games top 30 compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets in the two weeks up to August 18 and, like the micro charts, do not take account of mail order sales.

The micro charts this week show the number of machines sold in the two-week period ending two weeks before publication date, so they tell the story in the high street

GAMES

Top Thirty

			GAME TITLE	PUBLISHER	MACHINE	PRICE
▶	1	(1)	Jet-Pac	Ultimate	Spectrum	£5.50
▲	2	(5)	Transylvanian Tower	Shepherd	Spectrum	£6.50
▲	3	(7)	Tranz AM	Ultimate	Spectrum	£5.50
▲	4	(—)	Manic Miner	Bug Byte	Spectrum	£6.00
▲	5	(12)	Flight	Psion	Spectrum	£5.95
▶	6	(6)	Terrordaktyl 4D	Melbourne	Spectrum	£5.95
▼	7	(2)	Ah Diddums	Imagine	Spectrum	£5.50
▲	8	(13)	Horace and the Spiders	Psion	Spectrum	£5.95
▶	9	(9)	Killer Gorilla	P. Power	BBC	£7.99
▼	10	(3)	Penetrator	Melbourne	Spectrum	£6.95
▲	11	(—)	Jumpin Jack	Imagine	Spectrum	£5.50
▲	12	(15)	Krazy Kong	Interceptor	Vic 20	£6.00
▼	13	(4)	Arcadia	Imagine	Spectrum	£5.50
▲	14	(—)	Mad Martha	Mikrogen	Spectrum	£6.00
▼	15	(14)	The King	Microdeal	Dragon	£8.00
▲	16	(30)	Monsters in Hell	Softek	Spectrum	£6.95
▲	17	(27)	Miner 2049er	Big Five	Atari	£29.95
▼	18	(11)	The Hobbit	Melbourne	Spectrum	£14.95
▲	19	(—)	Frogger	Microdeal	Dragon	£8.00
▲	20	(24)	Heathrow ATC	Hewson	Spectrum	£5.50
▼	21	(19)	3D Tanx	DKTronics	Spectrum	£5.50
▼	22	(10)	Psst	Ultimate	Spectrum	£5.50
▼	23	(16)	Zenon 1	IJK	Oric	£5.50
▼	24	(18)	Cookie	Ultimate	Spectrum	£5.50
▼	25	(23)	Gridrunner	Llamasoft	CBM64	£8.50
▼	26	(21)	Timegate	Quicksilva	Spectrum	£6.95
▲	27	(—)	Superspy	Shepherd	Spectrum	£6.50
▲	28	(—)	Knot in 3D	New Generation	Spectrum	£5.50
▲	29	(—)	Test Match	Computer Rentals	Spectrum	£5.50
▲	30	(—)	Scrabble	Psion	Spectrum	£5.95

PCN Charts

between August 4 and August 18.

Neither mail order nor deposit-only orders are included and the prices quoted are for the no-frills models and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and, like the games, will be updated every alternate week.

PCN Charts are compiled by MRIB (Computers), London, (01) 408 0250.

HARDWARE

Top Twenty up to £1,000

►	1	(1)	Spectrum	£99	(SI)
►	2	(2)	Dragon 32	£175	(DR)
▲	3	(4)	BBC B	£399	(AC)
▼	4	(3)	Vic 20	£150	(CO)
▲	5	(9)	ZX81	£40	(SI)
▲	6	(7)	Newbrain A	£228	(GR)
▲	7	(8)	Oric 1	£99	(OR)
▼	8	(5)	Commodore 64	£299	(CO)
▼	9	(6)	Atari 800	£300	(AT)
►	10	(10)	Lynx 48	£225	(CA)
►	11	(11)	Atari 400	£150	(AT)
►	12	(12)	TI99/4A	£150	(TI)
▲	13	(17)	Apple IIe	£969	(AP)
▲	14	(18)	Sharp MZ80A	£549	(SH)
▼	15	(12)	Colour Genie	£168	(LO)
▼	16	(15)	Tandy Colour	£240	(TA)
▼	17	(16)	Sharp PC1500	£169	(SH)
▼	18	(17)	Epson HX20	£472	(EP)
▲	19	(—)	CGLM5	£150	(CGL)
▼	20	(19)	Aquarius	£99	(MA)

Top Ten over £1,000

▲	1	(2)	IBM PC	£2,392	(IBM)
▼	2	(1)	Sirius 1	£2,525	(ACT)
►	3	(3)	DEC Rainbow	£2,714	(DEC)
▲	4	(5)	Apple III	£2,780	(AP)
▲	5	(—)	Epson QX10	£1,995	(EP)
▲	6	(7)	HP86A	£1,541	(HP)
▼	7	(4)	Commodore 8096	£1,374	(CO)
▼	8	(6)	Olivetti M20	£2,754	(OL)
▲	9	(—)	Xerox 820	£2,415	(RX)
▼	10	(9)	Televideo TS800	£2,220	(MI)

ACAcorn Computers. **ACT** — ACT **AP** — Apple Computer. **AT** — Atari International. **CA** — Camputers. **CGL** — Computer Games Ltd. **CO** — Commodore. **DEC** — Digital. **DR** — Dragon Data. **EP** — Epson. **GR** — Grundy Business. **HP** — Hewlett-Packard. **IBM** — IBM. **JU** — Jupiter Cantab. **LO** — Lowe Electronics. **MA** — Mattel **MI** — Midlectron **OL** — Olivetti. **OR** — Oric. **RX** — Rank Xerox. **SH** — Sharp. **SI** — Sinclair. **TA** — Tandy. **TI** — Texas Instruments.

Don't carry a LOAD on your shoulders, unburden yourself on *PCN*'s letters page.

Dream machine Mark 2

May I say that the *PCN* Pro-Test of Richard King's dream machine is an inspired idea. Why not expand it by allowing others to describe their dream?

My 'dream machine' (could I call it the X2?) would have about as much similarity with Mr King's X1 as exists between a whippet and a mastiff. Mr King talks of screwing his machine to the wall and keeping it switched on, rather like a guard dog on a running line. Mine on the other hand would be lightweight, self contained and totally solid state.

Under a fold-down and lockable cover over the keyboard, the X2 would have an LCD screen the equivalent of a 12in monitor. The surface would be made up of hexagonal pixels that to the naked eye would appear as round dots; 2,500 of them to a square inch, a total of 200,000 (well I did say it was a dream machine, did I not?).

On the slope above the keyboard there would be a row of vertical slots to accommodate maybe a dozen bubble memory capsules, providing up to 3Mb of storage.

The X2 would resemble a wide Apple, because it would have a keyboard that would be much more complete, with a block of command keys and a scientific calculator pad flanking the centrally placed standard qwerty board. In addition there would be a single short, round key with a deeply recessed top to control the cursor, joystick fashion, with one finger. There would be a row of half-width, definable function keys with three special keys at the end of the row.

In a well under a small hinged lid to the left of the space bar would be the power/reset button. By holding down any or all of the special keys while pressing the reset button it would be possible to bring different PUs and their circuitry on-line, a total of seven options (Richard King's modules?).

My dream machine would run for 40-plus hours on a set of nicad batteries and via a plug would connect to a mains charger. For those conditions where mains power was not available, or was unreliable, an alternative light cell power block could be plugged in to keep the nicads fully charged. Shaped like a pocket book, it would open out to twice this area to expose the cells to light and would be powerful enough to drive the machine without batteries.

Because of the implied CMOS circuitry, cooling might not be a problem, but like Mr King's X1 my dream machine would have all circuits mounted vertically in convection labyrinths.

The zip-on carrying cover of the X2 would have a pocket to accommodate the power block laid open under a clear plastic panel so that it could be left, plugged in and switched on and that whether I spent a month or two in Italy, cruised the Mediterranean, attended a conference in Bonn, or became a beachcomber on Tahiti, I would always have my dream machine ready beside me.

I very much like the broad concept of Mr King's machine, but please tell him to incorporate mobility in his plans.

John D Griffiths
Reading, Berkshire

Richard tells me that the reason he wrote about his imaginary X1 was to look at how computers can or could work, not at physical construction per se. There could, of course, be many variations of his main theme — Ed

In defence of Mutant Camels

I am writing in response to the letter written by D Glancy (*PCN issue 22*).

First I would like to say that software reviews are always useful in helping to decide which package to purchase. It cannot be expected that reviewers should cover all eventualities, a program should do what it is intended to do and Attack of the Mutant Camels does that very successfully.

It is debatable what can be called a bug. I would like to suggest that a reasonable definition would be that a bug is anything that prevents a program from performing in its normal or intended mode of operation.

If Mr Glancy is suggesting that the game is bug-ridden rubbish then I wish to dispute this very strongly and state that I agree with the *PCN* review.

I have tried what he suggested and, although he is correct in stating that the camels can be destroyed by this method, only half the camels in sector one can be destroyed before they reach the right-hand side of the screen and sector defences are penetrated causing you to lose all your lives.

If you don't die this way you will certainly die of boredom because firing from the bottom of the screen is as exciting as watching grass grow.

B Rushby
South Wirral

Board of control for software

I am writing to you about software piracy. Most people pirate cassettes because, as Lyndon Martin mentioned (*PCN Issue 14*), people don't have enough money to spend on cassettes, and even when they do they are sometimes caught by the blurb on the cover and once the cassette is loaded they wish they hadn't wasted their money on such trash, as I have done on more than one occasion.

There should be a set price for all software (within reason; of course), and also there should be a board of people to examine the software and so avoid people being disappointed.

Andrew Luke,
Plymouth, Devon

The Apple and noises off

If Mr Davis (*PCN issue 22*) would remove his 'choked off' head from the Welsh sand, he might find that an awful lot of Apple zaps and bleeps have made their way into print. That they seem to have escaped him is hardly surprising considering he thinks the 'explosion' in micro sales is about 'as new as your magazine'. That's five months, by my reckoning.

No, pal, I've got a message for you: if *PCN* just churned out screens of boring POKEs to make the Apple utter a few pitiful screeches like some demented dodo, then it'd be us Apple users who've progressed beyond beginners' level that'd be bored out of existence.

There's nothing wrong with indulging your fantasies, but stop complaining about articles of the calibre of 'Apple Accompaniment'.

Jonathan Edwards
London W11

Rites of passage

N Sayers (*PCN issue 23*) has obviously not got past the 'Room with fiery walls', or even passed the 'bearded pirate'. To successfully pass the pirate, N must keep the bottle. The bottle can then be filled at the 'lake', and the water then thrown over the fiery walls.

The passable exit leads to a crevasse, which can be crossed as long as he has the wand and the silver. On the other side lie various treasures, as well as the 'swamp' and the 'troll bridge'.

M Weatherill
Leighton Buzzard, Beds

Share your thoughts in the UK's liveliest micro weekly letters columns. Funny, feisty or fanciful, your letter could win you £10 if it's of star status.

WRITE TO: Random Access, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

QUESTION

WHERE CAN I BUY

NEWBRAIN 'A' 32K	FOR	**£268.00**
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SINCLAIR SPECTRUM 16K	FOR	**£99.00**
SINCLAIR SPECTRUM 48K	FOR	**£129.00**
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SINCLAIR ZX81 RAM PACK	FOR	**£28.50**
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SEIKOSHA GP-100A PRINTER	FOR	**£215.00**
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ROUTINE INQUIRIES

Lost in a maze of bits and bytes, trapped in a forest of errors, or bugged by Basic? Whatever your problem, access our HELP function . . . better known as Max Phillips.

Write to: Max Phillips, Routine Inquiries, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

Commodore drives in detail

Q Please could you tell me, regarding the Commodore 64 and Vic 20, what the differences between the 1540 and 1541 disk drives are? If there is no difference, why do some dual disk drive users have two 1541s?
Daniel Hill,
Woodthorpe, Nottingham

A If I remember my Commodore model, the 1540 was the Vic 20 disk drive and the 1541 is an upgraded version of it, featuring a new chip that allows it to work with either the 64 or the 20. A glance at a Vic 20 price list will reveal an absence of the 1540 version.

The reason people use two 1541s is that it is the sensible way to run two drives off a Vic. To run other drives, such as the less aesthetic 8050 Pet dual drive, you'll need the IEEE interface.

Oric is big noise

Q I own a 16K Oric and have been exploring the sound capabilities. Oric's advertisement suggests that it is possible for the Oric to be linked to a hi-fi but I can't find any reference to this in the manual. Can it be done? What connections would I need?
Sohail Ashraf,
Edinburgh

A It's easy enough to wire the Oric's sound to whatever you like. The pin outs in appendix F (page 151) of the manual give the sound output as being on both pins four and five of the cassette port.

So you'll either need a specially designed cassette lead or you should be prepared to put up with switching between a cassette lead and a sound lead.

The wiring is simple enough. Pins four and five produce the sound output . . . take either one of these to your speaker, hi-fi or whatever. Ground can be wired from pin 2 to ground on the amplifier or whatever. As usual, check voltage levels before plugging the Oric into anything sensitive.

What I can't understand is why you want to amplify the sound even more. I thought the Oric was loud enough as it was. Remember that even the key-click will be noisier.

Bits and Beebs

Q I am thinking of buying a BBC Model B. I heard you can get it in kit form and would like to know how much it costs. Would it take someone brilliant at electronics to put it together? Would I get the 1.2 OS?
H K Kakad,
North Harrow, Middlesex

A The kit version of the BBC is the new Acorn Electron. By the time Acorn has finished bringing out the parts, this snap together kit will build into nearly a complete BBC.

Seriously though, there isn't a kit version of the BBC and if there was, it wouldn't be an easy beast to build. I don't know where you heard there was a kit — perhaps you are confused by the Acorn Atom (RIP) or by the fact that a BBC model A can be upgraded in stages to a Model B.

Even so, if you bought a whole BBC, I hope that it would come with the 1.2 MOS. After all, it is the current version of the software.

READ in the entrails

Q Whenever I try any program with READ in it on my Spectrum, despite both the manual and RESTORE command, I always get the Code 2 error 'Variable not found'. For example, in *PCN* Program-Cards, (issue 16, June 23-June 29) the Bowling game has a line 5 for f = 0 to 7:READa: POKE USR "A"+f,a: NEXT f.

Can you explain this?
W D Brady
The Netherlands

A I think it's just a question of being very careful when entering program listings. ProgramCards, like many published listings, are reproduced from listings taken straight from the machine. So the bulk of 'errors' tend to be mistakes made when entering it.

It sounds a bit nasty but if you get errors in the program, get checking. It helps a lot if you get a second pair of eyes to help.

There are all sorts of typos that could produce errors like the ones you find. Using an O (oh) for a 0 (zero) is an obvious one. You'll find many computers and printers cross their zeros to make the distinction clear. 1s, Is, Ls and suchlike can also get mixed up, though it is difficult to do on a Spectrum.

Other common problems are entering letters in the wrong case. On a Spectrum the variable F is different from f. And there are a few occasions when you can type out Basic words when you are supposed to use a single keyword. Always check the manual when you meet unfamiliar words.

Getting a working program from a listing does take time and effort. But with care, you should have no problems.

Spectrum graphic interlude

Q Having purchased the last seven issues of *PCN* I have found it very helpful, but having not seen the answers to the following two questions, I have decided to write to you.

I own a 48K ZX Spectrum and have been writing Basic programs for it, but I have noticed that professional programs are able to produce graphics while loading. Could you tell me how this is done?

Also, having purchased an assembler program, could you recommend a book on Spectrum machine code programming for the absolute beginner.
S. Barnett,
Wrexham, Clwyd

A There's one easy answer to your first query — it should come to you if you think about it. If you have a display from a previous program on-screen, and you don't clear it before loading the next program, you'll find you have a screen display while your program's loading, check?

So you write a small program to produce a screen display and to LOAD "". This takes you into your game proper. You'll find the program name overwrites your display, but you can deal with this by placing a patch of the relevant INK at the strategic point on the screen so that, although it's writing on it, it doesn't show. And you can do all this in Basic . . .

Once you can do this you'll realise that you need machine code to produce really pretty piccies, which brings us on to your next question.

There *are* machine code introductions for the absolute beginner around, but there are absolute beginners and absolute beginners, so what might suit one won't always suit another. Your best bet is to go down to your local micro store and have a good browse. Make sure you get a book that's the right style for you, and doesn't either throw you in at the deep end or mollycoddle you to death. One point to bear in mind is that the most useful books have indexes!

Extra K for Atari

Q I am a great fan of *PCN* and Atari. I was pleased to see the article in issue 16 about the Atari and the BBC micro. I have an Atari 400 home computer and I wondered if, like the 800, it has space behind the cartridge slot for memory modules. If so, where can they be purchased and could you tell me how much they cost?
Gary Watkins,
Sheerness, Kent

A The Atari has no cartridge slots for memory modules and cannot officially be expanded beyond the 16K it was given at birth. But there are ways and means of boosting the 400's memory to 48K. The Silica Shop and some other Atari dealers will often do a board swap that will see your 16K Atari board swapped for a 48K board — allowing you the extra memory without the extra cost of buying an Atari 800.

The upgrade costs £69 — although the price may soon drop with the release of the new Atari XL line of machines — and includes the discount given for the trade-in of your existing 16K board.

The 48K 400 doesn't have a second cartridge slot and can't be upgraded any further than 48K or handle an 80-column card.

But before you rush out to buy that upgrade, it may be worth considering the new line of Atari machines. The Atari 600XL will cost £159, will include Basic, a full-travel keyboard and an ability to run

all the existing Atari software.

It will also be upgradeable to 64K — with official Atari expansion modules — and will be able to take upgrade add-ons. And the new Atari 800XL will come standard with 74K and sell for only £249. If you want an Atari with more memory and a better keyboard, you're probably better off to sell your 400 and get a new 600XL than get the upgrade.

But if you've become attached to your 400 and want to upgrade it anyway, the Silica Shop can be reached on London (01) 301 1111.

Playtime for the 64

Q Referring to an article in *PCN*, issue 3, headed 'Simons not so simple', a firm is mentioned as producing 'a kit to convert an ordinary mono cassette player' for use with a Commodore 64.

This firm is Swanley Electronics. Please could you give me the company's address as I am desperate. If possible, could you tell me if there is any other company producing them.

Clive A. Jenkins,
Barry, South Gamorgan

A You'll find Swanley Electronics at 32 Goldsel Road, Swanley, Kent, tel (0322) 64851.

If you're really that desperate, the only other souce I can find is an American company called Microwave Distributing Inc, 1342 B Rt. 23, Butler, New Jersey 07405, USA. This company makes a tape interface that should fulfill your needs.

If money is your prime consideration then by all means go ahead with the conversion, but there are other aspects to think about. First and foremost you should keep in mind the reliability of Commodore's dedicated unit.

Secondly, with the audio recorder you'll need a separate power supply. As you start expanding your system you'll find that an extra lead among a jumble of others could be the final straw.

Son of Spectrum still distant

Q There is a rumour making the rounds amongst friends and dealers I have spoken to that Sinclair is going to launch the ZX83 in a few months time. I have been told that the machine's memory will be in the region of 96 to 128K and it will also have a disk drive — can you confirm that this is true?

M. Ahmed,
London SE11

A Unfortunately we don't know anything about the next Sinclair product either. Typically, the company is mysterious about what it has in the pipeline.

We do know, however, that there is another machine on the drawing board. According to Sinclair's Managing Director, Nigel Searle, it is likely to be along the lines of a small business machine — other than that, we'll all have to keep guessing.

The ZX83 (or whatever it's eventually called) almost certainly won't be featuring disk drives.

Instead we would bet the ZXn will incorporate the recently released Microdrives (see *PCN issues 23 and 25*).

Screen until I'm Vic . . .

In Microwaves (*PCN, issue 17*) you published a program called 'Big Screen for the Vic'.

This routine does not work and half fills the expanded screen with 'rubbish' characters. I have worked out that the problem occurs in line 30 but do not know the solution.

M. Parker,
London N10

A The routine does work as stated — it gives you a screen of 28 x 36 characters. However, it didn't really go far enough.

In order to get the extra screen space, the routine 'steals' it from Basic memory. When you turn on your Vic all of this RAM is filled with garbage which is displayed on the new screen.

The problem is that the Vic's operating system is not designed to work with a bigger screen area than the usual 22 x 23, so pressing the CLR key only clears the same area as before — 506 spaces. As you've no doubt discovered, the cursor does strange things too.

So you have to ignore the usual operating system and make your own. At the simplest level you can do this with POKEs. For example, FOR I = 7168 TO 8167: POKE I, 32: NEXT will clear the screen.

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A new slant on Oric script

Fancying a change of character shapes I started calculating the POKEs for an italic set. It was straightforward but laborious and repetitive so I abandoned my efforts and wrote the following routine which italicises the character set automatically.

```
10 DEF FNA(X) = INT (X/2 - ((3 AND X) = 1))
20 FOR X = 46344 TO 47080 STEP 8
30 POKE X, FNA (FNA (PEEK (X)))
40 POKE X+1, FNA (FNA (PEEK X+1)))
50 POKE X+2, FNA (PEEK (X+2))
60 POKE X+3, FNA (PEEK (X+3))
70 POKE X+4, FNA (PEEK (X+4))
80 NEXT
```

Alan Northcott,
Wokingham, Berks

S-t-r-e-t-c-h your Newbrain

The easiest way to obtain a printer line length greater than 80 characters on the Newbrain is to use the communications port — device driver 9 — instead of the printer port.

This has the effect of sending a CR for a newline as opposed to CRLF (carriage return and line feed) and also suppresses the TAB spaces for control code 9 — essential for bit-addressable printing.

No printhead check is made and consequently there is no limit to the line length (other than the width of the printer carriage).

Mark Finnis,
Swindon, Wilts

Slow lister for the Texas

The Texas T199/4A lists at such a fast speed that it is impossible to check each line individually for bugs. Granted, it is possible to list chunks of a program at a time, find the bug and edit the offending line but this is unnecessarily tedious.

If you use the NUM command it makes editing and checking a lot easier. Type in NUM and the line number you want to start checking from, and then the value of the space between each line number, eg NUM 130, 10.

Each time you press ENTER the next line will be printed with the cursor at the beginning of the line. Correct the line, press ENTER and the new line will be accepted into the program. The next line will appear ready to be checked.

Ian Fereday,
Bontddu, Gwynedd

Newbrain shorthand

Newbrain users who have used a BBC micro will have noticed how useful all the command abbreviations can be. Although not documented in the manual or the beginner's guide, a similar function is available on the Newbrain.

Pressing the GRAPHICS key with the A key, for example, is the same as typing LIST. Listed below are some of the more useful commands that can be accessed in this way. Others can be found by experimentation. They need to be followed by return or Control/M to execute.

```
GRPH/A ..... LIST
GRPH/B ..... NEW
GRPH/D ..... RUN
GRPH/T ..... SAVE
GRPH/U ..... LOAD
GRPH/V..... RANDOMISE
```

David Mingay,
Wokingham, Berkshire

TRS80 autostart

Here are four lines of assembler coding which will autostart a machine code program and also stop the RESET button from returning to Basic. This works on the TRS80 Model 1 and will probably also work for the Model III.

```
ORG 41ACH
JP    START; Program start
ORG 41E2H
JP    START; Program start
```

41ACH is called by the interpreter every time the RESET button is pressed. Normally there's only a RET and two NOPs there. These can be replaced by a JP vector to your program.

For the sadistic-minded a HALT can be placed here.

41E2H is called every time the SYSTEM command places the "? on the screen. As before, there are only a RET and two NOPs here. When loading is complete the RET has been changed to a JP to the program start which it executes.

There are also two routines in the Tandy ROM which will save you a few bytes if you program in machine code.

One, at 0049H, waits for a key to be pressed and stays there until the search is successful. The value of the key pressed is placed in the accumulator.

The other is a delay. A CALL to 0060H will cause the processor to decrement BC until it equals zero whereon it will return.

Both routines should be CALLed.

Derek Grainger,
Fleetwood, Lancs

Colour Genie memory miser

When you turn on the Colour Genie you have 9.7K of memory free to the user. By doing three things, this can be increased by another 4.3K to almost 14K.

1. When the machine is turned on, hold down the MOD SEL key. This makes the area in memory, usually assigned to storing the hi-res page, free to users.
2. Type 32767 when the machine asks for the memory size, when it is turned on. This makes the area in memory, usually kept for the shape table, free for use.
3. Type CLEAR 0.

This space saving is very useful if a file handling program is being used — up to 30 extra files can be stored. Also in word processing when there is room for another 4,000 or so characters of text.

P Billet,
Malmesbury, Wiltshire

Border lines on the Spectrum

ZX Spectrum users who change their border colour within a program will probably have been annoyed or dismayed to find two lines at the bottom of the screen remaining in the old border colour. There is a simple way of including these lines in the border colour change. All that is required is to follow the border command with INPUT "" thus:

```
10 BORDER 5: INPUT ""
20 GOTO 20
```

What happens here is that the INPUT causes the bottom two lines to change to the current border colour in preparation for input. Since there is no variable for the input to be loaded into there is hardly any delay before the next program statement is executed.

I have also discovered a couple of interesting things about PRINT. By using ' you can continue a print at the beginning of the next line on the screen. Thus: PRINT "HELLO"'"BYE BYE" will print to the screen as

```
HELLO
BYE BYE
```

David Jones,
Edmonton, London

Timed events

The Newbrain has an internal timer that can easily be accessed from Basic. To set the timer to 0, CALL 62383. To read a value from the timer, CALL 62399,x.x will contain the time elapsed in 50ths of a second so divide by 50 to convert to seconds.

G Freislander,
Whitfield, Manchester

Acorn Atom decimalised

For Acorn Atom owners not having the Floating Point extension ROM, the following short routine is useful for providing decimal answers to division.

```
10 @ = 0; P. $12
20 IN. "X"X; IN. "Y"Y
30 A = X/Y; B = X%Y*10; C = B/Y; D = B%Y*10; E = D/Y; F = D%Y*10; G = F/Y
40 P. "X/Y = "A"."C,E,G
50 E.
```

It will be seen from line 30 that the number of decimal points calculated can be increased as required.

This is most useful as a subroutine in accounts/financial programs.

J H Godfrey,
Handsworth, Birmingham

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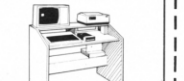

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Dave Gunthorpe is your guide in this exploration of the Newbrain, where flexibility rules.

Map reading the Newbrain

One of the major joys of using Newbrain Basic is the range of commands. These allow you to write programs without having to know 101 PEEKs and POKEs to use the facilities of the machine. Compared to some machines, a newcomer can become remarkably proficient in the use of the machine, and never be aware of the Newbrain memory map, or even have used a PEEK or POKE.

When you start to look around the Newbrain memory map you'll run into a few surprises. Whenever the Z80, the heart of the Newbrain, is reset, it fetches its first instruction from location 0. Therefore most small systems always have ROM in low memory and RAM in higher memory (the Spectrum has ROM from 0 to 16383).

But the Newbrain's memory map has RAM at 0, with special circuitry to force the ZX80 to start elsewhere in memory (at 0E000H in fact).

This means that the Newbrain can alter its interrupt behaviour, as all its major routines are contained as vectors in RAM.

The Newbrain isn't made easier to map with this memory layout. As devices are opened, the source code area of Basic is moved up and down through memory and only a few locations in zero page hold the key. The area of memory from 0 to 0268H is constant, and the first 120 or so locations give pointers to relevant sections of code. Listing 1 gives some of these.

4 and 5 is the top of IOS and the first location used by Basic.

6 and 7 is the last location of memory used by Basic (= TOP)

19 is the default device for loading Basic, set to 1, and POKE 19, 2 makes the second cassette port the default.

43 is how the keyboard (for Devices 0 3 & 4) is decoded.

92 and 93 points to the start of current screen memory.

POKEing other locations can have disconcerting results. For example, POKE 51,1 will turn off the screen, and POKE 51,0 turns it back on again.

The IOS area of memory contains all current active devices. When a device is opened, memory for it is allocated at the top of IOS RAM (moving Basic up):

```
10 OPEN#1,0,1,"s120"
20 OPEN#0,0
```

This moves #0 above #1 in memory. Opening and closing a device means that for a short period the memory map is volatile. The opening/closing mechanism doesn't inform the system of the changes it has made until it has finished and is successful, so the screen is shut down for the duration (explaining screen flicker during the open and close statements).

Listing 2 shows us around the screen memory. It is important to note that each line has, for hardware reasons, a length of either 64 or 128 per line, and every line starts on a 64 byte boundary. Each screen copy has associated memory to contain its own workspace, eliminating interference between screens.

Even allowing for the above, if you try POKEing directly to screen there is a reasonable chance that you may not see anything. Turn on your Newbrain, clear the screen and move the cursor down five lines or so, POKE 650,65, and a capital A appears on the top line, or it will when you POKE 642,65. The problem is that, in the design of the Newbrain, the video display circuitry stops the CPU.

To reduce the slowing effect of the video circuitry, at the end of each display line the OS writes a 00H byte, however it is written where the OS thinks each line terminates, and direct access of the screen does not inform and modify, and so the video will not display anything to the right of the 00, as it does not know about it. Putting a 00 directly into video memory can have some very odd effects, including speeding up the Newbrain.

Listing 3 takes us into Basic. Basic takes what's left of memory and divides it first into two sections, the first growing from B3PRM up, and the second area starting at the top of memory and growing down. The lower section contains the source code listing. Again, this is different from the normal structure. For a start the line number is separated out into a line number table and the second area in the lower memory is object code.

The statement by Grundy that its Basic is 'dynamically compelled' has caused much confusion. When a line is entered, it is entokened (to see the entokened form list a program by entering SAVE#0). The line number is stored into the line number table, and the entokened line is stored into the source code area.

When the line is executed (an immediate command being given a line number of 0), it is first passed to the compiler, which generates a series of 'Y Codes' (very similar to p-Code), which is placed in object code memory. That is then passed to the runtime module. This executes the line, but that line is then left in memory and the next line is compiled. If a line is already compiled the compiling process is skipped.

Information on which lines are compiled is contained in the line number table. Object code is 'deleted' by CLEAR, DELETE, RESERVE, MERGE, RUN, STOP and END, as variables are pointed to directly (rather than by searching for a variable at runtime) and the above Basic

LISTING 3

```
65000 b3 = PEEK(4) + PEEK(5) * 256
65010 pt$ = "Pointer to "
65020 PRINT "B3PRM (Base of Basic program)   =";b3[5]
65030 x = PEEK(b3+6)
65040 PRINT "Current I.O.S. output stream    =";x[5]
65050 x = PEEK(b3+7)
65060 PRINT "Current I.O.S. input stream     =";x[5]
65070 x = PEEK(b3+8)
65080 PRINT "Last error number               =";x[5]
65090 x = PEEK(b3+9) + PEEK(b3+10) * 256
65100 PRINT pt$;" input routine              =";x[5]
65110 x = PEEK(b3+12) + PEEK(b3+13)
65120 PRINT "Input pointer save location     =";x[5]
65130 x = PEEK(b3+14) + PEEK(b3+15)*256
65140 PRINT pt$;" top of source code         =";x[5]
65150 x = PEEK(b3+16) + PEEK(b3+17)*256
65160 PRINT pt$;" top of object code         =";x[5]
65170 x = PEEK(b3+18) + PEEK(b3+19)*256
65180 PRINT pt$;" base of user stack         =";x[5]
65190 x = PEEK(b3+20) + PEEK(b3+21)*256
65200 PRINT pt$;" base of for block          =";x[5]
65210 x = PEEK(b3+22) + PEEK(b3+23)*256
65220 PRINT pt$;" base of gosub stack        =";x[5]
65230 x = PEEK(b3+24) + PEEK(b3+25)*256
65240 PRINT pt$;" base of string area        =";x[5]
65250 x = PEEK(b3+26) + PEEK(b3+27)*256
65260 PRINT pt$;" base of array area         =";x[5]
65270 x = PEEK(b3+28) + PEEK(b3+29)*256
65280 PRINT pt$;" base of symbol area        =";x[5]
65290 x = PEEK(b3+30) + PEEK(b3+31)*256
65300 PRINT pt$;" base of line table         =";x[5]
65310 x = PEEK(b3+32) + PEEK(b3+33)*256
65320 PRINT pt$;" top of basic area          =";x[5]
65330 x = PEEK(b3+59) + PEEK(b3+60)*256
65340 PRINT"Line Number for on break         =";x[5]
65350 x = PEEK(b3+57) + PEEK(b3+58)*256
65360 PRINT "Line Number for on Error        =";x[5]
65370 x = PEEK(b3+39) + PEEK(b3+40)*256
65380 PRINT "Line number of break occured    =";x[5]
65390 x = PEEK(b3+41)
65400 PRINT "Statement in which break occured=";x[5]
65410 x = PEEK(b3+41)
65420 LINPUT("Press NewLine to Continue ")a$
65430 PUT 24
65440 ?"Size of Source code Area = ";
65450 x=(PEEK(b3+14)+PEEK(b3+15)*256)-b3:?x
65460 ?"Size of Object code Area = ";
65470 ?(PEEK(b3+16)+PEEK(b3+17)*256)-(b3-x)
65480 ?"Top of Memory            = ";TOP
65490 ?"Size of Line Number Tablep ";
65500 a=TOP-(PEEK(b3+30)+256*PEEK(b3+31)):?a
65535 END
```

LISTING 4

```
65100 OPEN #0, O, "70": z8 = FALSE
65105 z1 = PEEK(4) + PEEK(5) * 256
65110 z2 = PEEK(z1+28) + PEEK(z1+29) * 256
65120 z3 = PEEK(z1+30) + PEEK(z1+31) * 256
65130 FOR z0 = z2 TO z3 - 8 STEP 8
65140 z1 = PEEK(z0) + PEEK(z0+1) * 256
65150 z4 = z1/1024
65160 z5 = (z4 - INT(z4)) * 1024
65170 IF z5 = FALSE THEN z8 = z8 + 1: GOTO 65360
65180 z6 = INT(z5 / 37)
65190 z7 = z5 - (z6 * 37)
65200 z6 = z6 + 65
65210 IF z7 < 26 THEN z7 = z7 + 65
65220 IF z7 < 36 THEN z7 = z7 + 22
65230 IF z7 = 36 THEN z7 = FALSE
65235 IF z6 = 90 AND (z7 > 47 AND z7 < 58) THEN 65350
65240 z4 = INT(z4/2): zz$ = ""
65250 IF z4 = 0 OR z4 = 33 THEN 65360
65260 IF z4 = 19 THEN zz$ = "deffn" + CHR$(z6) + CHR$(z7): GOTO 65350
65270 IF z4 = 27 THEN zz$ = "deffn" + CHR$(z6) + CHR$(z7) + "$": GOTO 65350
65280 IF z4 = 18 THEN zz$ = CHR$(z6) + CHR$(z7) + "(1)": GOTO 65350
65290 IF z4 = 20 THEN zz$ = CHR$(z6) + CHR$(z7) + "(2)": GOTO 65350
65300 IF z4 = 26 THEN zz$ = CHR$(z6) + CHR$(z7) + "$(1)": GOTO 65350
65310 IF z4 = 28 THEN zz$ = CHR$(z6) + CHR$(z7) + "$(2)": GOTO 65350
65320 IF z4 = 24 THEN zz$ = CHR$(z6) + CHR$(z7) + "$": GOTO 65350
65330 zz$ = CHR$(z6) + CHR$(z7)
65350 IF INSTR(zz$,"ZZ$") > FALSE THEN 65360
65353 IF INSTR(zz$,"½Y$") = FALSE THEN z8 = z8 + 1: GOTO 65357
65355 GOTO 65360
65357 PRINT zz$,
65360 NEXT z0
65370 PRINT: PRINT
65380 PRINT "Number of constants =";z8
65390 END
```

LISTING 1

```
65000 REM Zero Page Map. Unexpanded
65010 REM
65020 DEFFNa(x)=PEEK(x)+256*PEEK(x+1)
65030 ?"B5PHM   Base of Basic          =";FNa(4)[5]
65040 ?"B4      Top of Memory +1       =";FNa(6)[5]
65050 ?"Print line lentn for Tab, Pos=";PEEK(27)[5]
65060 ?"Print head position            =";PEEK(28)[5]
65070 ?"Print Zone Lentn  (TAB)        =";PEEK(29)[5]
65080 ?"DEFAULT Driver for Basic       =";PEEK(11)[5]
65090 ?"DEFAULT for LOAD SAVE VERIFY   =";PEEK(19)[5]
65100 ?"KB Mode                        =";PEEK(43)[5]
65110 ?"Start of Stream Table          =";FNa(86)[5]
65120 ?"Start of IOS Memory            =";FNa(98)[5]
65130 ?"STMTOP  end of Stream          =";FNa(100)[5]
65140 ?"DEVTAB  DEvice TAble           =";FNa(102)[5]
65150 ?"Char Lkup for Hi -res Chars    =";FNa(119)[5]
65200 ?"Interupt Response Vector       =";FNa(57)[5]
65210 ?"NMI     REsponse Vector        =";FNa(103)[5]
65220 ?"Entry Point for IOS (RST 32)   =";FNa(33)[5]
65230 ?"Entry Point for IOS (RST 40)   =";FNa(41)[5]
```

statements cause the variable table to be moved, because reserved memory and the line number table live above the symbol table.

Examination of the line number table shows that each statement has a separate entry, a multi-statement line being stored as a series of the same line number, but with a different source code pointer. Each segment of source code is terminated by a CR (chr$(13)).

In the symbol table, entries are eight bytes long. The first two bytes contain the variable name (ten bits) and whether it is a number, a string, or a one or two dimensional array. Listing 4 is a simple utility to dump variable names.

As we now have a Basic memory map we can look at the device drivers themselves.

The IOS is the root of the flexibility of the Newbrain. Under the IOS all input/output is reduced to a simple streaming of information. The Newbrain allows for 256 streams, with only stream #0 being fixed, as that is the default for Basic, and any device may be attached to any stream.

The device drivers are accessed by a table (pointer in zero page at locations 88 and 89), which is kept in the 0E000H ROM, but can be relocated anywhere in memory and then be modified. Byte 0 at DEVTAB contains the number of entries, and then each device is a two byte pointer for the address of the handling routines of each device driver. In the base version of the machine there are 12 entries. Adding the disk controller adds devices 12 to 15.

Entry from CP/M to Basic and back in an expanded system is via the command EXIT (a keyword from Basic & a .COM file from CP/M). On the unexpanded system the command is CPM from Basic. On the expanded system the EXIT command takes you into a menu from which you select your destination.

The second way of using CP/M is under Newbrain Basic, and appears as four devices under IOS. Device #12 is closest to the cassette in use, and is the default device for LOAD and SAVE. Although file names now have to comply with CP/M's file output format, it is not made obvious in the manual that a file can be routed other than to drive A by following the normal CP/M format. Thus to save a file to drive B, you type SAVE "B: testfile.bas". The .BAS is not a standard extension and must be supplied if wanted.

LISTING 2

```
65000 REM Current Screen Mapper
65010 REM reports stats on Current Output Screen
65020 sm = PEEK(92)+256*PEEK(93)
65030 ?"Base of Screen Memory          =";sm[5]
65040 ?"Offset to Start of Screen      =";PEEK(sm)[5]
65050 ?"Screen Lenth                   =";PEEK(sm+4)[5]
65060 ?"Screen Width                   =";PEEK(sm+5)[5]
65070 ?"Screen Excess                  =";PEEK(sm+6)-PEEK(sm+5)[5]
65080 ?"Flags Reg 1                    =";PEEK(sm+7)[5]
65090 ?"Extra Flags                    =";PEEK(sm+8)[5]
65100 ?"Lines to Cursor Position       =";PEEK(sm+9)[5]
65110 ?"Frame, # line to first disp.   =";PEEK(sm+10)[5]
65120 ?"Padding Space. to get display"
65130 ?"On a 64 byte Boundary          =";PEEK(sm)-21[5]
65140 ?"First Location for SCreen      =";sm+PEEK(sm)+5[5]
65535 END
```

Device #13, is for text files.

Device #14 is the random access file device. Compared to other CP/M Basics this is not easy to use. A file is opened in the normal way, but reading and writing requires a six byte sequence to be written to the Channel initially. The first three bytes are the byte displacement from the beginning of the file, and the second group of three bytes defines the number of bytes to be read or written. Exactly that many bytes *must* be read or written.

For example, to write 30 bytes into a file on stream #99, starting at byte number 300 from the beginning of the file:

```
10000 rem write 30 bytes from a$ to #99
10010 rem on entry a$ must be 30 bytes
      long, if not will be left padded
10020 IF LEN(a$)<30 THEN a$ = " "
      &a$:GOTO 10020
10030 IF LEN(A$)>30 THEN A$ =
      LEFT(A$,30)
10040 D1=0:D2=1:D3=44:REM POINT
      TO 300th Byte of file
10050  B1=0:b2=0:b3=30:  REM WE
      SEND 30 BYTES
10060 put#99,d1,d2,d3,b1,b2,b3
10070 ?#99,a$
```

However, reading a file requires a series of GETs, as unless you specifically write out (and allow for) a CR LF then there are no terminators to read back the above record:

```
15000 d1=0:d2=1:d3=44
15010 b1=0:b2=0:b3=30
15020 PUT#99,d1,d2,d3,b1,b2,b3
15030 nu /= (2^16*b1) +(256*b2)+b3
15040 a$=""
15050 FOR co=ITO nu
15060 get#99,b$
15070   a$=a$+b$:IF   LEFTS$(a$,1)="
       "THENa$=""
15080 NEXT co
```

Device # 15 is a device for communication with CP/M, and allows such things as renaming a file, deleting a file, reset drives (Cnt1/C from CP/M), log onto a different drive, search for first and search next. The last two enable you to read the CP/M directory from Basic. However, unlike most CP/M Basics, the filenames are read into strings and allow the Basic program to manipulate them.

The Newbrain OS link into CP/M gives Newbrain users the best of both worlds — the capability to use both CP/M and Newbrain Basic and communicate between the two, and to share common files.

ANIROG SOFTWARE

XENO II

An E-XPANDED-D screen presentation with superb action packed space thriller written entirely in machine code with four action packed stages. To destroy the power source of Xeno II you have to fight off waves of robot attack, plasma bombing by the legions of the outer sanctum and finally attack the power source protected by a force field, continuous bombardment by quadrams and blockading by wild whirling suicidal space ships. Truly a game for all arcadians.

JS **VIC 20** **16K** **£7.90**

CAVERN FIGHTER

All M/C version of SCRAMBLE

KB/JS **VIC 20** **Unexp. £5.95**

TINY TOT'S SEVEN

Super games pack for younger children with bright colour graphics and sound effects. Everybody's favourite Simon plus Super Snap, O's and X's, Word Jumble, Bomber, Duck Shoot and Mad Drivers.

KB **SPECTRUM** **16K/48K** **£4.95**
KB **VIC 20** **Unexp.** **£5.95**

PHARAOH'S TOMB

Once you enter, the only way out is with the aid of a key which unlocks the mystery of the Pharaoh's tomb. Beware of the mantraps the ancient Egyptians so painstakingly built. One false move and you will meet the same fate as befell other tomb robbers over thousands of years. A multi-screen big graphical adventure with M/C movements.

KB **VIC 20** **16K** **£5.95**

ZOK'S KINGDOM

Your starcruiser badly damaged in a meteor storm is forced to crash land on the planet ruled by ZOK, a time space generated image of Dracula. You are challenged to a battle of wits and endurance as the battle for survival starts in earnest in this big multi-screen graphical adventure in hi-res graphics and M/C movements.

KB/JS **VIC 20** **16K** **£5.95**

FROGRUN

Popular arcade game. All machine code with brilliant colour graphics and sound effect. Features include snakes, crocodiles, lady frogs, turtles, cars, lorries and logs.

KB/JS **VIC 20** **Unexp.** **£5.95**
KB/JS **SPECTRUM** **16K/48K** **£4.95**
KB/JS **COMMODORE 64** **£5.95**

DOTMAN

Ghosts chase you as you try to eat the dots and collect points. You can turn the tables on them by eating the pills. Don't forget the ghosts have been given intelligence and will try to corner you. This feature makes Dotman exciting and challenging. All M/C game complete with running and highest scores and tunnels.

JS/KB **VIC 20** **Unexp. £5.95**

GALACTIC ABDUCTORS

A stunning action packed game which uses all of your TV screen for the superb large animated graphics. Giant Space Hawks whirl and weave in intricate patterns as they drop their deadly homing mines which will destroy your base on contact. While you are busy defending yourself the Hawks will feed on your helpless population returning only their skulls. All M/C game complete with high score table that will blow your mind with its graphics and sound effects.

JS **VIC 20** **16K** **£7.90**

SLAP DAB

An exciting game based on the arcade game PAINTER which combines fast action with strategy. Giant insects hiding under the old paint surface are released by your paint brush. You require fast action and quick thinking to outwit them and finish the panel. The game is 100 percent machine code and HI-RES. graphics also includes HI-score and running score with brilliant sound effects.

KB/JS **VIC 20** **UNEXP £5.95**

CRAWLER

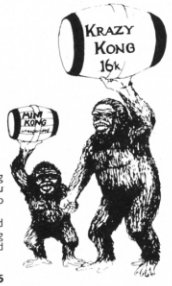
All M/C version of Centipede

JS **VIC 20** **Unexp. £5.95**

3D TIME TREK

At last a 3D game for the VIC! Although badly wounded you are determined to seek and destroy the marauding space pirates who have now dispersed around the galaxy in search of fresh prey. A brilliant Startrek game with a difference — spectacular 3D graphics and real arcade actions.

JS **VIC 20** **16K** **£5.95**
JS **COMMODORE 64** **£5.95**



MINI-KONG

For UNEXP from the writer of Krazy Kong comes the equally brilliant Mini-Kong. You will wonder how he managed to cram so much in the unexpanded VIC.
Brilliant multi-colour graphics, expanded screen, lift, rolling barrels, ladders, running score/HI-score and not to forget the hand bar bonus in this all M/C presentation.

K.B./J.S. **VIC 20** **UNEXP £5.95**

KRAZY KONG

An E-XPANDE-D screen large graphics rolling barrels, hammer, fireballs, lifts, handbags and umbrellas as you try to rescue the damsel Kong has abducted. Spectacular collapse of Kong's lair in the fourth screen. Uses all 21K of your expanded Vic for this 100% M/C thriller. Complete with high score table.

KB/JS **VIC 20** **16K** **£7.90**

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ANIROG SOFTWARE
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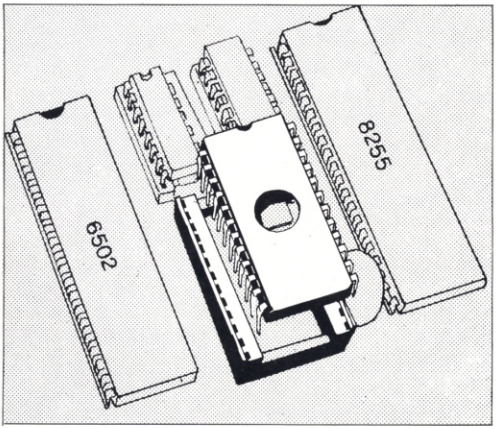
The price of Acorn's Atom has fallen dramatically. Geof Wheelwright warns of the consequences.

Atomic warning



Installing the Word Pack ROM: the ROM plugs into an available socket on the main board of the Atom, the utility ROM socket. It is located towards the centre of the board between the 6502 main processor and the 8255 IC. Make sure the notch on the Word Pack ROM faces the back of the board (matching the other ICs), and don't bend the pins by forcing it in.

The introduction of the new Electron micro from Acorn *(see this week's Hardware Pro-Test, pages 24-27)* has sent the price of the old Acorn Atom plunging. With prices as low as £50 for the machine, it's tempting to consider buying it for a simple dedicated purpose.

Since the machine (like the BBC) offers the capacity for sideways ROM software it could be well worth getting a spreadsheet or word processing ROM and dedicating an Atom to doing that task. You would be hard-pressed to find a better buy. But don't expect to be able to buy any add-ons in a year from now as you may not be able to get them.

For word processing, you would have to make sure that:

- You get a fully expanded Atom — 12K RAM + 12K ROM and a printer interface.
- You make sure the word processing program has got all the facilities you need. A ROM-based word processor like Acorn's Word Pack ROM is recommended — costing around £25.
- You ensure that your TV will have a relatively tight hold on the Atom's video signal, as there is nothing more tiring and frustrating than trying to work on an out of focus screen.

The Word Pack is a particularly good idea in this case because it takes up no internal memory and provides a full range of text-editing facilities, including insertion and deletion, page numbering and block moves. The Atom gives a 40 column display and has room for about three A4 size pages in memory.

Cursor control includes auto-repeat on the keys and single movement to the start and end of lines in the text. The Atom is probably the only micro available for under £100 with a full-travel keyboard and printer interface, although the printer interface only comes with the expanded version of the Atom. Acorn has, in the past, offered a BBC Basic board for the machine (*PCN Issue 3*), but it's anyone's guess as to how long the company will keep producing that, or any other add-ons.

Acorn has said they'll continue supporting the Atom for two years after its 'death', but it's unclear at what level that support will be maintained. It took *PCN* some weeks to get a copy of the Word Pack.

Many Acorn dealers have already made it clear that once they've rid themselves of their current stocks of Atoms, they don't have plans to stock peripherals or software for the machine because it's obsolete.

So be careful when buying a cut-price Atom. If you're sure of what you want to use it for and can get the equipment necessary to use it as a dedicated word processor or accountancy aid, then it's well worth it.

If not, then take heed — 'from little Acorn Atoms . . . do great problems grow'.

The Atom Word Pack ROM plugs into a socket at the back of the Atom board. Acorn calls it a utility ROM socket, but it serves the same function as the sideways ROMs on the BBC and can be found between the 6502 processor and the 8255 chip at location IC 24.

Great care must be taken, however, to make sure the notched end is facing away from you and that you don't bend the pins when you stick the chip in.

The easiest way to get the chip in without bending the pins is to ease one side in first, making sure all the pins are properly aligned with their corresponding sockets, and then push it slightly to one side so that the pins on the other side now align properly.

When all the 'legs' of the chip are in place, press it firmly to make sure strong contact is established. When you subsequently boot up the Atom, the program should then be available in ROM.

The same procedure is undertaken with all Atom ROM software, including Atom-Calc — a 4K ROM spreadsheet which gives the traditional sideways scrolling to give a grid of up to 62 columns and 255 rows.

Each position in the grid can contain a label, number or calculation — so that well-documented spreadsheets are easily developed with the program.

Of course, this sad state of affairs doesn't apply to all Atom peripherals. If you get the Atom with a built-in printer interface it shouldn't take much to hook it up to many standard printers.

And there are Atom peripherals which will only sell to Atom owners — and they will be available as long as stocks remain. One of these is the Atom Disk Pack — so large, bulky and ugly a device that no-one except Atom owners will be able (or want) to use it.

The disk pack plugs into the expansion interface at the back of the Atom and requires some internal modifications to be made.

Some extra buffers must be added to drive the expansion bus and these you can either install yourself or have installed for you (I would recommend the latter). But it requires a certain mechanical bent and a willingness to dirty your hands inside the machine.

Brian Cadge concludes his series on machine code utilities with a high-resolution screen dump.

Dragon screen test

The Dragon 32's parallel I/O socket allows a wide variety of printers (and other devices) to be connected. The pin connections are given in the 'additional information' booklet, so it is not difficult to connect any printer with a Centronics type interface to the machine.

Print problem

However, there are a number of points that Dragon omits to tell you about having a printer connected. Some are just useful to know, while others may be vital. For example, in programs that give printer output, if no printer is connected, the machine hangs up — just try ?# −2 with nothing plugged in — you will have to press RESET to recover control.

However, if you type: ? PEEK(65314) AND 1 then the result will be 1 if no printer is there, or 0 if one is there and is ready. In fact, this is the printer 'BUSY' connection used by Basic.

The other more important locations are in the system variables. Some printers do not give auto wrap round if a line is too long, but the Dragon can be made to send a linefeed after any number of characters in the following way: POKE 155, *width of printer (eg 80)* and then to get the Dragon to send linefeeds type POKE 328, 0.

To disable this type POKE 328, 255.

You can cause the Dragon to leave a gap between listed lines with POKE 330, 2, and disable this with POKE 330, 1.

Finally, you can set the number of spaces between items printed with commas separating them. Use POKE 153, N: POKE 154, PEEK(155), −N where 'N' is the number of spaces — initially set by the Dragon to 16. Note that if location 155 is not POKEd with the width of the printer, then the POS(−2) function will not operate correctly.

The other end of the connection is just as important — the printer itself. The ASCII (American Standard Codes for Information Interchange) characters are supposed to be a standard, but printers vary as to the meaning of codes below 32, the non-printable control codes. 13 is usually linefeed and 27 is usually an escape character, but others are less reliable.

Many dot matrix printers can produce high resolution printouts. The obvious use for this would be for copying the Dragon's graphics screen, PMODES 3 and 4. The program listed will do this for most printers. Beware though: you must make sure of the control code to designate graphics mode and POKE this to location 32536, and POKE 32662 with the control character for text mode.

As the program stands these are set to 18 and 30 respectively. The correct codes for your printer should be in the user's manual.

The way in which printers produce hi-res graphics is based on seven vertical dots per byte, whereas the Dragon produces eight horizontal dots per byte. The eighth bit is used to designate graphics on a printer.

This is the format most printers use (eg Tandy, Seikosha etc). If your printer does not use this method or does not have a hi-res facility then you cannot use the program.

The reason for using a machine code routine is not only for the sake of neatness and memory saving, but for speed. The listing of a HRG dump written in Basic will do the same job, but takes many times longer. In this case it is also actually easier to write a machine code routine than a Basic one.

M/C entry

To enter the program, type in the machine code entry program, SAVE it and RUN it. Take care with the DATA statements as these contain the machine code. To avoid a crash, the program checks for errors and will not run if any are found. Once the program has been successfully entered, remember to change lines 160 and 170 to any necessary POKE.

To call the screen dump routine use X= USR0(n) where 'n' is the graphics page number from which the copy is to start, *ie* it is the number that follows the mode number in a PMODE statement. The number must be in the range of 1 to 5.

The works

The assembly language listing shows how the program actually works; line 30 calls the ROM routine to return the value in the USR argument.

The other ROM call to 48373 made throughout the program is a routine that sends the character in the 'A' register to the printer. This is not the same address as the Basic ?# −2 uses — that is 48410 and is not used as it intercepts certain codes and could mess up the printout.

The main section of the program is a nested loop to go through each byte of the screen, seven bits vertically at a time building up the code to be printed.

The routine could be used to print in the other PMODE resolutions, but would certainly need some modification as these all use less memory and some only require 16 bytes per line, whereas the program expects 32 bytes.

I leave it up to you to customise the program as you like — the program has been kept as simple as possible so as to allow it to be used with as many different printers as possible, but you can certainly mess around with it to make it suit your own printer better.

One final note: as the program is presented, it will copy the screen in black and white as displayed.

To get it to print in inverse, all you need do is type: POKE &H 7F3F, &H 27 and POKE &H 7F3F, &H 26 to return to normal.

LOADER PROGRAM

```
10 'MACHINE CODE ENTRY PROGRAM
20 CLEAR200,32499
30 FOR I=1 TO 167:READA$:Z=VAL("&H"+A$):CS=CS+Z:POKE 32499+I,Z:NEXT
40 DATA BD,8B,27,5D,27,4,C1,5,23,5,C6,2,7E,83,44,8E,6,0,5A,27
50 DATA 6,30,89,6,0,20,F7,BF,1,40,86,D,BD,BC,F5,86,12,BD,BC,F5
60 DATA BE,1,40,86,7,B7,7F,9E,34,10,86,80,B7,7F,9B,F6,7F,9E,86,80
70 DATA B7,7F,9C,86,1,B7,7F,9D,34,4,A6,84,84,7F,9B,26,9,B6,7F,9D
80 DATA BB,7F,9C,B7,7F,9C,78,7F,9D,35,4,30,88,20,5A,26,E3,B6,7F,9C
90 DATA BD,BC,F5,35,10,34,10,74,7F,9B,26,C7,35,10,30,1,1F,10,C4,1F
100 DATA 26,B6,86,D,BD,BC,F5,10,BE,1,40,31,A9,17,A0,30,89,0,C0,34
110 DATA 20,AC,E1,27,4,22,9,20,9B,86,3,B7,7F,9E,20,94,86,D,BD,BC
120 DATA F5,86,1E,BD,BC,F5,39
130 IF CS<>18075 THEN PRINT"DATA ERROR":END
140 DEF USR0=32500
150 '**********************************
160 'POKE 32536, PRINTER GRAPHICS MODE
170 'POKE 32662, PRINTER TEXT MODE
180 '**********************************
```

The machine code entry program for the hi res dump, shown in disassembled form on the facing page. When the program is correctly entered, run it. You can call the screen dump with X=USR0(n) where n is the graphics page number.

A Basic version of the program. This will work but will take an unacceptable amount of time. When you have entered the machine code version, compare the two.

```
10 'HRG PRINTER DUMP IN BASIC
20 O=1536
30 PRINT#-2,CHR$(10);
40 FORI=0 TO 6143 STEP 224
50 FOR J=0 TO 31
60 FOR B=0 TO 6
70 A(B)=PEEK(I+O+J+B*32)
80 NEXTB
90 FOR B=7 TO 0 STEP -1
100 Z=0
110 FOR C=0 TO 6
120 IF A(C)<INT(2^B) THEN 150
130 A(C)=A(C)-INT(2^B)
140 Z=Z+INT(2^C)
150 NEXTC
160 PRINT#-2,CHR$(Z+128)
170 NEXTB,J
180 PRINT#-2
190 NEXTI
200 END
```

```
7EF4
7EF4
7EF4 BD9B27
7EF7 5D
7EF8 2704
7EFA C105
7EFC 2305
7EFE C602
7F00 7E8344
7F03 8E0600
7F06 5A
7F07 2706
7F09 30890600
7F0D 20F7
7F0F BF0140
7F12 860D
7F14 BDBCF5
7F17 8612
7F19 BDBCF5
7F1C BE0140
7F1F 8607
7F21 B77F9E
7F24 3410
7F26 8680
7F28 B77F9B
7F2B F67F9E
7F2E 8680
7F30 B77F9C
7F33 8601
7F35 B77F9D
7F38 3404
7F3A A684
7F3C B47F9B
7F3F 2609
7F41 B67F9D
7F44 BB7F9C
7F47 B77F9C
7F4A 787F9D
7F4D 3504
7F4F 308820
7F52 5A
7F53 26E3
7F55 B67F9C
7F58 BDBCF5
7F5B 3510
7F5D 3410
7F5F 747F9B
7F62 26C7
7F64 3510
7F66 3001
7F68 1F10
7F6A C41F
7F6C 26B6
7F6E 860D
7F70 BDBCF5
7F73 10BE0140
7F77 31A917A0
7F7B 300900C0
7F7F 3420
7F81 ACE1
7F83 2704
7F85 2209
7F87 209B
7F89 8603
7F8B B77F9E
7F8E 2094
7F90 860D
7F92 BDBCF5
7F95 861E
7F97 BDBCF5
7F9A 39
7F9B 12
7F9C 12
7F9D 12
0140
7F9E 12
7F9F
```

```
20      PRT
25 *HRG DUMP TO PRINTER
30 @BEGIN JSR 35623     GET USR VALUE IN B
40      TSTB
40      BEQ @ERROR      IF ZERO THEN ERROR
50      CMPB #5
50      BLS @OK         IF <=5 THEN OK
60 @ERROR LDB #2        ERROR 2 IS SN ERROR
60      JMP 33604       GOTO ERROR ROUTINE
70 @OK LDX #1536        START OF GRAPHICS MEM
80 @GET DECB
80      BEQ @GOT        RIGHT ADDRESS
80      LEAX 1536,X     NEXT GRAPHICS PAGE
80      BRA @GET        TRY AGAIN
90 @GOT STX @START      STORE START ADDRESS
100     LDA #13         LINEFEED CHAR
100     JSR 48373       PRINT IT
110     LDA #18         GRAPHICS MODE
110     JSR 48373       PRINT IT
120     LDX @START      GET START OF GRAPHICS
120     LDA #7
120     STA @NO         STORE NUMBER OF VERTICAL DOTS
130 @LOOP PSHS X        SAVE X REGISTER
140     LDA #128
140     STA @MASK       SET MASK TO BIT 7
150 @BIT LDB @NO        GET NUMBER OF VERT DOTS
150     LDA #128
150     STA @CHR        GRAPHICS CHAR
150     LDA #1
150     STA @ROW        SET PRINTER MASK TO FIRST DOT
160 @LP2 PSHS B         SAVE B REGISTER
170     LDA ,X          GET GRAPHICS BYTE
180     ANDA @MASK      MASK OFF UNWANTED BITS
190     BNE @NODOT      BRANCH IF DOT NOT ON
200     LDA @ROW        GET PRINTER DOT#
200     ADDA @CHR       ADD IT TO CHAR CODE
200     STA @CHR        STORE BACK IN CHAR
210 @NODOT LSL @ROW     NEXT PRINTER DOT
220     PULS B          RESTORE B REGISTER
220     LEAX 32,X       NEXT GRAPHICS BYTE DOWN
230     DECB            DECREMENT LINE COUNT
240     BNE @LP2        IF NOT ZERO GO AGAIN
250     LDA @CHR        GET CHARACTER
250     JSR 48373       PRINT IT
260     PULS X
260     PSHS X          RESTORE X REGISTER
270     LSR @MASK       NEXT DOT IN GRAPHICS BYTE
280     BNE @BIT        IF NOT LAST BIT GO AGAIN
290     PULS X          RESTORE X REGISTER
300     LEAX 1,X        NEXT GRAPHICS BYTE HORIZONTAL
310     TFR X,D         LET D=X
320     ANDB #31        NEWLINE HERE
320     BNE @LOOP       IF NOT THEN GO AGAIN
320     LDA #13
320     JSR 48373       SEND LINEFEED TO PRINTER
330     LDY @START      LOAD Y WITH START
330     LEAY 6048,Y     LOAD WITH END ADDRESS
340     LEAX 192,X      POINT X AT 7 DOTS DOWN
340     PSHS Y          PUT Y ON STACK
350     CMPX ,S++       COMPARE X TO Y
360     BEQ @LAST       IF EQUAL THEN GOTO LAST
370     BHI @FINISH     IF HIGHER THEN FINISHED
380     BRA @LOOP       OTHERWISE GO AGAIN
390 @LAST LDA #3
390     STA @NO         ADJUST # OF DOTS FOR LAST SCAN
390     BRA @LOOP       GO AGAIN
400 @FINISH LDA #13
400     JSR 48373       LINEFEED PRINTER
410     LDA #30
410     JSR 48373       SET PRINTER TO TEXT MODE
420     RTS             RETURN TO BASIC
430 @MASK NOP
440 @CHR NOP
450 @ROW NOP
460 @START EQU 320
470 @NO NOP
480     END @BEGIN
```

Just a sawn-off BBC, or the wonder of the year? Max Phillips puts Acorn's Electron through its paces.

Electronic theory

Acorn's Electron looks set to be the hit micro of 1983. Memories of the euphoria that surrounded the painful launch of the BBC micro are recalled by the excitement generated by the Electron.

But the machine itself holds no such surprises. It's a cut down BBC, pure and simple, with just eight chips replacing the BBC's expensive and complicated board. It runs MOS 1.0 and Basic 2.

Nevertheless it would be a mistake to view the Electron as a poor man's Beeb. It's minus a fair number of features, in particular the BBC's copious interfacing, but even so, it will come as a shock to the cheap end of the market.

Presentation

The Electron comes in an anonymous cardboard box, a tradition few manufacturers cling onto. Inside, it's a very complete package — you get machine, oversize power supply, TV and cassette lead, introductory cassette and two manuals.

The 'welcome' cassette is a mixture of new and converted BBC programs. Its little booklet has been moved into the user guide, but first timers will find it an easy way to meet their machine.

Documentation

Fortunately, Acorn has gone to town on the documentation. The BBC-style user guide is a bit smaller and a bit better organised, although much of it is copied wholesale from the original. You also get *'Start programming with the Electron'* by Masoud Yazdani. This is the 'from scratch' tutorial that was such an ironic omission from the educational BBC micro. Yazdani is friendly, lively and ever so structured!

It's an excellent introduction to the Electron, and I'll lay odds on a BBC edition soon. But it is very BBC-Basic specific. Oh well. At least it puts a stop to all those 'Learn your micro on the bus home' books that the pulp publishers keep churning out.

But nobody's perfect. The Electron user guide is probably a good source for information on Basic 2. Contrary-wise, the BBC's user guide is a good source for Electron *FX calls. This will create a nice market in manual photocopies. But for some bizarre reason Acorn has declined to document all the available calls. And it has also skimped on technical info like what goes on in the expansion connector and so on. And it's worth noting that our sample user guide speedily fell to pieces.

Construction

The Electron is beautifully designed and built — quite a shock compared to the BBC. Its designer case will look great on the coffee table. Certainly, the serious look will appeal to those put off by construction of the Spectrum and Dragon ilk. The looks conceal a small board running with just eight chips — the 6502, two 16K ROMs, four 64K bit RAM chips and an all-singing all-dancing 64 pin ULA. The design raises all sorts of issues.

For starters, on this issue 1 board, you have separate MOS and Basic chips. Production models (the ones nobody's seen) will have a single ROM socket. So in theory on this machine you could pull out Basic and stuff something like the View word processor in. In practice, it won't be possible on the Electron.

Next the RAM. 32K is produced by some clever decoding with the ULA. This requires two accesses to each chip to read a whole memory location. Result: the Electron goes slower than you'd expect.

The ULA also provides the display — there isn't a 6845 as there is on a BBC. Screen generation also slows the machine down, and not having a 6845 precludes some tricks like positioning the screen with *TV and the fast sideways scrolling used on some arcade games.

Curiously enough, some display modes are faster than others. Benchmarks reveal Modes 0 to 2 to be the slowest and Modes 4,5 and 6 to be the fastest. Mode 3 is a touch faster than the slow modes, apparently simply because of unused scan lines between each screen line!

Keyboard

The keyboard is unrivalled on cheap machines, except perhaps by the Vic 20. The nearest thing to it is the Lynx, and perfectionists may complain of similar blunt fingers and a 'dead feel'. But the layout is remarkably good. You *can* get a complete keyboard in just 56 keys. Ten programable function keys are available by holding down FUNC and pressing a number key. These work just like the orange function keys on a Beeb.

FUNC in combination with a letter key produces single keystroke Basic keywords — a rather superfluous but non-compulsory way to enter programs. Shift-FUNC is a Caps lock and controls a yellow LED buried out-of-sight on the left of the keys.

Above — Ten programmable function keys are available and they work just like those on the BBC.
Right — A variety of screen formats are provided by the six BBC modes.

Speed	Mode	No of characters	Resolution	Colors	Memory used
1×	0	80×32	640×256	2	20K
1×	1	40×32	320×256	4	20K
1×	2	20×32	60×256	8+8 flashing	20K
1.15×	3	80×25	text only	2	16K
2×	4	40×32	320×256	2	10K
2×	5	20×32	160×256	4	16K
2×	6	40×25	text only	2	8K

The BBC's awkward shift lock has been sensibly forgotten about.

All the usual Acorn keys are there — Break, Escape, Copy, Delete and the four arrows. Acorn has missed a good chance to do a proper cursor cluster, leaving the arrows in an awkward square. Five of the keys are shared by three characters. SHIFT and CTRL select the top two characters — a simple system.

Screen

The Electron drives an ordinary TV or an RGB or composite video monitor. The TV picture is, as the BBC, plain remarkable. Even 80 column text is readable. Unfortunately, the review machine consistently lost the top line of text. And of course, *TV doesn't work. It's also worth moaning that the composite video output is still black and white only.

The Electron supports BBC Modes 0 to 6. These provide a variety of screen formats to allow the programmer to choose between having lots of text, graphics and colours and not using up the memory. The above table lists the choices available. The speed column gives an idea of the relative speeds of each mode.

The Electron looks pretty impressive compared to its rivals. An 80 column, 640×256 display is unrivalled by every machine up to the BBC Model B itself. If you're into serious display work, the Electron is the obvious choice, although its eight colours are a bit limiting. But don't be taken in by the numbers. Resolution isn't everything and machines such as the Atari offer fabulous colours and sprites to provide dramatic graphics. The problem is that the displays are taken from user RAM. At most the Electron has 21K free. At worst, you're down to 12K.

The Electron really suffers from not having a BBC style Mode 7. This is a teletext style display that uses up a mere 1K of memory. So not only is 21K a bit of a restriction, there are also hundreds of BBC programs that will have to be modified to work on the Electron.

Keeping costs down is obviously important with the Electron, and leaving out a teletext generator was an unfortunate sacrifice. And it's a shame that Acorn hasn't included a software simulation of a teletext screen purely for compatibility purposes. It would be awfully slow and take up piles of memory, but it seems a lazy omission.

Storage

For now, storage is provided for using the BBC's reliable cassette system. There are no problems here — it always has been a superb system. Disks will no doubt be available later on, though you're going to need some adds-ons — space for a DFS chip and disk interface as well as the drive itself.

Expansion

This is the other sore point. All the Electron has is an edge connector. This is somewhat more complex than those used on Commodores and Sinclairs simply because of the timing involved. Acorn itself describes interfacing as a 'non-trivial job'.

This leaves buyers at the mercy of Acorn's delivery schedules for adds-ons. Acorn is promising stuff to take the Electron up to and beyond the BBC, probably in both price and spec. First off will be a box allowing further ROM applications programs to be plugged in.

Screw fixings underneath the Electron suggest that it could be a big box. But the real shame about the Electron is that you are going to need to pay extra for interfaces.

As it stands, the Electron is ruined by the lack of a printer port. Many will view it as a games machine, for which joystick ports would be a good idea. It may not matter to people who can only just afford the machine and don't want to buy a printer. But the Electron is a serious little machine and people shouldn't have to pay extra to expand it.

Operation

The Electron (or Elk as the nickname goes) works like a slow BBC. Speeds can be up to around four times slower, though BBC Basic remains a fast little mover. Relative to the competition, the Electron is delightfully quick. Graphic games in Basic are definitely possible.

Everything else relates to BBC MOS 1.0 (why not version 1.2?) and BBC Basic 2. Acorn hasn't spent much time moving these across. Many of the commands and calls are simply switched off — the point being to maintain compatibility with BBC programs.

Take sound for example. The Electron doesn't have the three voice synth chip used on the Beeb. Instead it provides a single note channel and a noise channel, either of which can be on or off.

Sound is produced with the SOUND command though on the Electron, and

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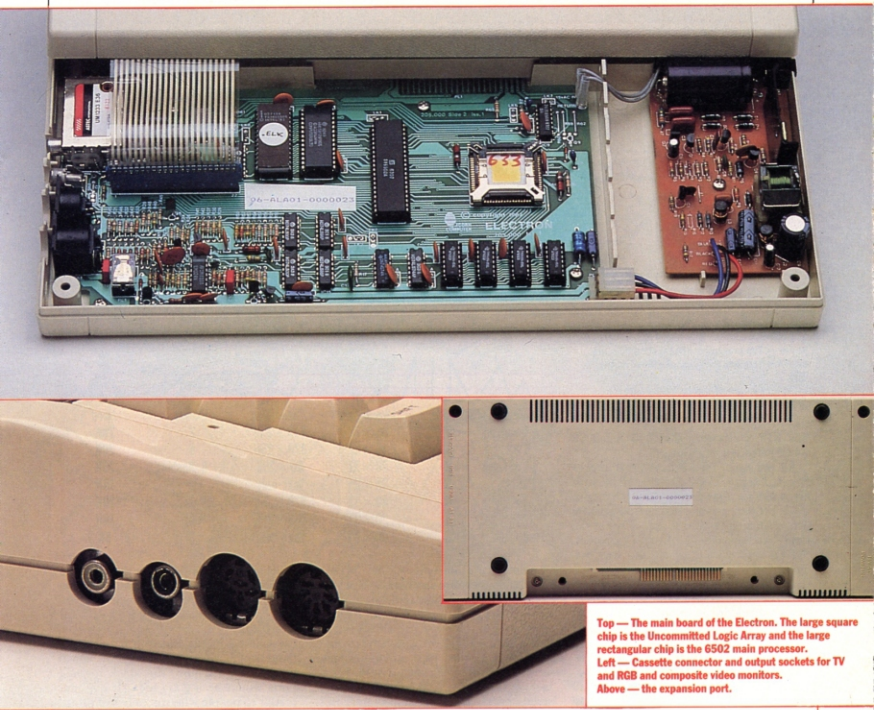


Top — The main board of the Electron. The large square chip is the Uncommitted Logic Array and the large rectangular chip is the 6502 main processor.
Left — Cassette connector and output sockets for TV and RGB and composite video monitors.
Above — the expansion port.

◄ 25

channels 1,2 and 3 all refer to the same channel.

Volume can still be set from 0 to −15, though the Electron takes 0 as off and anything else as maximum. The ENVELOPE command to shape the type of sounds produced still has 14 parameters. Only the first eight do anything, the last six being the dummies required for the BBC. Similar 'closed doors' greet anything that is in the BBC and not in the Electron.

Software

The Electron has an incredible head start in life. BBC micro software is very patchy — some is bad, some is brilliant — but there is lots of it and it won't take much to move most programs over to the Electron. So Acorn has made a very clever move going for a clipped-wing BBC.

Unfortunately, the Electron's hardware will restrict the more serious side of software for a few months to come. Not having a printer interface rules out a cheap word processor, for example. So expect the Electron to grow up as a games machine.

Verdict

Acorn has an undoubted winner. The Electron isn't quite as simple as a half priced BBC, but it does bring you amazing graphics and one of the fastest and most capable Basics in the business. It's easy to use, and easy to learn. Only the lack of built-in interfacing and technical information spoil the Electron's image. For a while the price will be a stumbling block, but I suspect that it could be lowered to £150 if need be.

'The Electron brings you amazing graphics and one of the fastest and most capable Basics in the business'

SPECIFICATION
Price £200
Processor 6502A 2MHz
RAM 32K
ROM 32K
Text screen 7 formats up to 80×25, 8 colours
Graphics Up to 640×256
Keyboard 56 keys, 10 function keys, optional keywords
Storage Cassette 300 or 1200 baud
Interfaces Expansion connector
OS/Language MOS 1.0/BBC Basic 2
Distributor Acorn Computers, Fulbourn Rd, Cherry Hinton, Cambridge
Software supplied Introductory cassette

Adieu to the Atom

The good news is that the introduction of Acorn's under £200 Electron micro has forced the price of the ageing Acorn Atom to as low as £50. But the bad news is that those stock-clearing prices mean the Atom is going out of production — and that software and peripherals for the machine are going to be hard to find in the future.

The Atom was a good deal in its day. It isn't much larger than the Electron and for £174 offered between 2 and 12K of RAM, ROM-based software and a printer interface on the expanded version of the machine. It was originally a kit-machine for enthusiasts, who had to build it before they could use it — but in latter days it has been offered in ready-made form for a slightly higher price.

It was small and uncluttered inside, so there was little room for expansion circuitry. Only a couple of expansion boards could be fitted to the machine and the colour card tended to heat up.

Some of the facilities now on offer for the Electron and the BBC were first tried on the Atom. Econet, Acorn's local area network system, was first configured on the Atom and many schools still use Econetted Atoms in conjunction with BBC systems.

The Electron also inherits the same processor as the Atom — the 6502.

The Atom used a more idiosyncratic Basic than the Electron, but a BBC Basic board was available for it. This gave the machine much the same capabilities as the Electron's implementation of BBC Basic.

The Atom version of BBC Basic also didn't use all the BBC sound commands and only partially implemented its VDU commands. But it did allow for the tidy DEF and PROC keywords as well as the CHAIN command.

A disk system was even offered for the machine. It cost about twice as much as a new Atom and was consequently not a big seller. The disk system is not yet on offer for the Electron, although Acorn says it plans to make available in the future an expansion interface that will allow the machine to run BBC disk drives.

The Atom disk pack was considerably larger and heavier than the computer itself — it was actually an Olivetti OPE FD 501 with 92K on a standard 5¼-inch single-sided drive. It had its own power supply — which in turn supplied power to the Atom — and used a disk operating system in ROM.

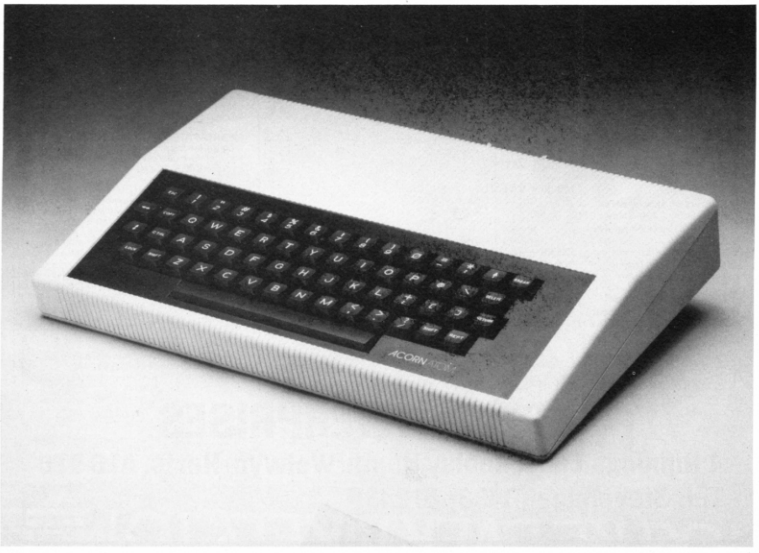
Again like the Electron, the Atom used a separate power supply which put the machine in the 'lightweight' category. And like the BBC, it offered the capacity for sideways ROM software — including spreadsheets and word-processors. (See page 21).

Besides the obvious differences in memory and language, the addition of colour in the Electron puts it in a class apart from the Atom. Although a colour card could be purchased for the Atom, it was never known as a particularly reliable device.

The Atom did shine, however, as a programming machine — offering both the Forth and Lisp languages on cassette. It's likely that the BBC versions of those languages will be made available for the Electron on plug-in ROMs when the Electron plug-in ROM card is ready.

In short, the Electron has as much (if not more) in common with the phased-out Atom than it does with the BBC. The prices of the two machines are similar, they use the same processors, have the same keyboards and offer much the same standard facilities.

It does seem odd, however, that Acorn has introduced us to the ELECTRONic age after putting us through the ATOMic age. But then who ever said computing was a logical business? **Geof Wheelwright**



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Can Simons Basic calm Susan Curran's love-hate relationship with the Commodore 64?

Basically a better 64

Of all the micros I've used, the Commodore 64 is my least favourite, in spite of its great graphics and sound potential. When you sit down to bash out what should be a half-hour program, you end up tearing your hair out three hours later as the computer carries on doing anything but what you intended.

One obvious problem is the built-in Basic, which may have been fine in the early Pet days but now looks extremely sparse. It has no support for the hi-res graphics and sound. Patient 64 owners have been waiting for months as Commodore debugged its advanced Simons Basic — rumoured to more than make up for the shortcomings in the built-in version — and put it into secure cartridge form.

Features

The Basic certainly has all the features it was rumoured to have, and more than enough to knock the stuffing out of the independent programmers' toolkits which have been filling the gap over the past year. There are 114 additional commands, and most of them are well worth having. The entire list is summarised in the table.

There are 19 general entering/listing/debugging/program securing commands, filling most of the gaps in the original Basic. KEY assigns up to 15 characters to each function key, and DISPLAY gives you a directory of the assignments you've made. RENUMBER is unusually limited, since it doesn't bother to correct GOTOs or GOSUBs.

PAUSE stops the program dead for a predefined number of whole seconds only. It disables the STOP key, but can be broken into by a RETURN. CGOTO is an unusual computed GOTO, using variables in computing the line number.

PAGE, OPTION and DELAY respectively enable you to control the number of program lines listed at once, to highlight Simons Basic commands, and to change the scroll speed. Not as handy as the Beeb's LISTO, but still helpful. FIND prints out the numbers of lines including a tightly-specified (even leading spaces count) string.

DISAPA and SECURE are used together to blank out specified program lines, in order to secure a program from unauthorised listing. Listing a program in which they've been used, you simply get a succession of blank line numbers. Very neat stuff. OLD is a BBC-style command which cancels the effect of NEW.

A good, though unusual range of string handling commands seems particularly oriented to word processing. There's even a CENTRE command (centres text on screen) built in. DUP is the equivalent of Microsoft's STRING$. ATs after PRINT can be strung together as in Sinclair Basic. USE enables you to select print formats for numeric data.

Structured programming enthusiasts can breathe a sigh of relief — REPEAT . . . UNTIL is here, as well as IF . . . THEN . . . :ELSE: . . . (with a weird syntax), and RCOMP, a sort of multiple IF . . . THEN . . . :ELSE: . . . A structure new to me, LOOP . . . EXIT IF. . . END LOOP, is somewhere between REPEAT . . . UNTIL and WHILE . . . WEND (which isn't included). You can put multiple exit conditions anywhere inside the loop.

There are two different kinds of named procedure, open and closed, broadly corresponding to GOTOs and GOSUBs. These can be nested up to nine deep. Local variables can be defined for use inside procedures, but there's no provision for passing parameters to procedures, as you can in BBC Basic. I was sorry to find this missing. Procedure names can be of any length, so long as they fit onto the program line, and can consist of more than one word.

There's a fairly good ON ERROR set of commands, though the errors that can be reported don't, oddly enough, include those unique to Simons Basic. STOP doesn't trigger ON ERROR, and there is no ON BREAK sequence. I would have found one very useful for turning off sprites, which otherwise linger on as shady ghosts at the end of a program run.

FETCH is a great command. It enables you to specify the number and type of characters (shifted or unshifted, alphabetic or numeric) that you want to receive as input. Invalid input is simply ignored. ON KEY is another useful input validation command, a sort of specialised menu-oriented ON . . . GOTO. (No point using RENUMBER after this one.)

Four tidy commands read input from light pens, paddles and joysticks. The JOY(stick) command doesn't cover selection of a joystick, nor did the manual mention which of the two ports it reads by default. Strange, since the POT command (for paddles) does so.

One of the good features of the original Basic is that the graphics aren't mode-bound. You can, if you are prepared to put in a few hours of programming effort, mix text, high resolution and medium (multi-colour) resolution graphics on the same screen. I didn't expect Simons Basic to support this, and it doesn't. High and medium resolution are rather awkwardly linked together, and the same commands can be used for each, but moving from hi-res to multi-colour mode corrupts any hi-res plotting already on screen.

The text screen is completely separate. You can write a text string on the graphics screen, and increase its scale vertically, but the Basic doesn't let you include variables in the statement, so it takes some acrobatics to get, say, a game score on screen.

The range of hi-res commands is very good. It includes line, point, rectangle and circle (including ellipse) commands, as well as an ARC command. Curiously, only the latter lets you specify dotted lines. An unusual ANGL command draws radii of an invisible circle, like spokes of a wheel. There's a rather clumsy DRAW command for drawing irregular shapes, and ROT, used with this, lets you scale and rotate them. PAINT is slow-moving, as always, but BLOCK lets you draw solid rectangles more rapidly.

There is another good range of screen handling commands for use with the text screen, including FLASH, FILL to fill screen areas with specified characters, and MOVE to duplicate screen sections elsewhere. The sectional scroll is supported. There's a memory dump command (SCRSV, and SCRLD to reload) for the text screen, but no comparable one for the hi-res screen. However, two parallel commands let you print a hard copy of either type of screen.

The sprites (or MOBs — 'moveable object blocks') and duly supported. High level commands cover defining them, moving them, clearing them, and the collision detection features. There's a similar DESIGN command for normal user-defined characters.

The sound commands, described under the heading 'Making Music', are fairly comprehensive, and quite straightforward considering the complexity of the hardware they are controlling. What is lacking is a basic SOUND-type command which you can use without going through the palaver of defining envelopes and waveforms. As it is, you have to use five different commands, VOL, WAVE, ENVELOPE, MUSIC and PLAY, in order to emit even a simple beep.

Presentation

The clearly labelled cartridge comes in a box, with a large format, ring-bound manual.

The manual is spread out on good quality paper and comes in narrative form, with longish example programs covering whole ranges of commands. There is an index, but no ready-reference section, so checking on syntax involves a lot of thumbing through.

The manual reads well, but on closer acquaintance it proves to be a depressingly familiar Commodore job, full of silly mistakes. Often the syntax was inadequately explained, and sometimes the manual was wrong — the screen and border numbers following COLOUR, for instance, were reversed. Any user would

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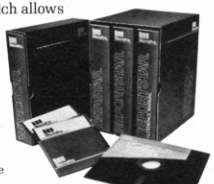

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need to resort frequently to the Programmers' Reference Guide to make sense of the murky passages, and in comparison with that, this came across as superficial and simple-minded.

In use

Getting started is no problem, you just plug the cartridge in. As it tells you on power-up, it leaves you 30,719 bytes of memory to play with.

Most of the commands are well thought out, and compare reasonably well with similar commands on rival micros. I've tried most, but not all of them, and with few exceptions they worked as promised.

I found the colour commands confusing, however. There are half a dozen different ways of changing the colour on the graphics and text screens, and these interacted in unexplained ways. I couldn't make the sample program for the FILL command (which was supposed to generate random coloured blocks) produce any colour changes at all after NEWing, for instance. I had to reset the computer before it would work.

A more disconcerting problem came when I tried the sample sprite program. As soon as I tried to run it, it appeared to 'auto-destruct'. Up came an error message (my mistake), and when I tried to list the program to correct it, nothing was there at all. Once I'd got a debugged version working from tape, I still found that it only worked once. Re-running it drew a complete blank.

A little research suggested that for some unexplained reason, the program was reserving for the sprites the very start of the user program memory, presumably where the program itself was stored. Overwriting the listing to store the sprites may be memory-efficient, but it is hardly sensible.

In general, I found the failure to link the Simons Basic manual with the rest of the Commodore 64's Basic reference material disconcerting. The Simons sprite designing commands, for instance, are beautifully clear and easy to use, but ridiculously memory-hungry. It takes 22 or more lines of program, with up to 25 characters to a line, to define a single sprite. Direct reference to the more advanced, memory-efficient ways of doing the job would have been a good idea.

In general, the commands seemed to work with reasonable, though not incredible, speed.

Once I'd learned to avoid some of the obvious pitfalls, things began to look much brighter, and I did manage to turn out some decent graphics programs in far less time than it would have taken (had I dared to try) on the basic machine.

Reliability

Simons Basic does stretch to ten additional error messages, not really enough for 114 commands. The sprite error message 'BAD CHAR FOR A MOB', used as a catch-all for just about every mistake I could make, was particularly exasperating, as it didn't relate efficiently to the line on which the error occurred.

On the bright side, OLDing my program after a COLD reset nearly always worked. Once or twice it came up with a previous program after I'd been trying in vain to load a new one.

Verdict

This has to be mixed. The Commodore 64 is capable of such a lot, and Simons Basic makes an extremely impressive attempt at supporting its capabilities. But at the same time, turning the capabilities into solid performance using a high-level language remains a problematic business, and at several points it seems that the sheer complexity of the hardware defeated David Simons' ingenuity. On the whole, I would have preferred 50 rock-solid commands to 114 problematic ones.

But if you have a Commodore 64, and want to program it, then this package really is a must for you. I can't imagine that any independent producer could offer anything to touch it, and it will put a lot of sprite-designer and utility packages onto the remainder shelves.

If Commodore had only taken the trouble to document it adequately, pointing out any known bugs so that programmers can work round them, I would have recommended it with far less hesitation.

SAMPLE LISTING
Designing a Sprite (MOB)

```
100  DESIGN 0,63*64
110  @........BBB............
120  @.......BBB.............
130  @.......BBBBB...........
140  @........BBB............
150  @........BBB............
160  @....BBBBBBBBB..........
170  @...BBBBBBBBBB..........
180  @..BBBBBBBBBBB..........
190  @..BBB.BBBBBBB.BBB......
200  @..BBB.BBBBBBB..BBB.....
210  @...BBBBBBBBB...BBB.....
220  @....BBBBBBBB....BBB....
230  @.....BBB.BBB...........
240  @.....BBB.BBB...........
250  @.....BBB.BBB...........
260  @.....BBB.BBB...........
270  @.....BBB.BBB...........
280  @.....BBB.BBB...........
290  @.....BBB.BBB...........
300  @.....BBB.BBB...........
310  @....BBBBB.BBBBB........
```

Line 100 designates a type of sprite ('0' for high resolution), and sets aside a block of memory to store the sprite data. The remaining lines describe the sprite. The Commodore 64 has a good screen editor, so you can quite literally design the sprite on-screen while writing the program. For multi-coloured sprites, letters C and D are added to describe the two additional colours. The main sprite colour is selected when you allocate the design to a sprite register (with the MOB SET command), so you could have eight different versions of this man, all in a different colour. All very neat, though rather heavy on memory requirements.

Simons Basic commands

KEY	DISPLAY	AUTO	RENUMBER
MERGE	PAGE	PAUSE	
OPTION	DELAY	FIND	TRACE
RETRACE	DUMP	COLD	OLD
RESET	CGOTO	DISAPA	SECURE
INSERT	INST	PLACE	DUP
USE	CENTRE	AT	LIN
FETCH	INKEY	ON KEY	DISABLE
RESUME	MOD	DIV	FRAC
%	$	EXOR	DISK
DIR	COLOUR	HIRES	MULTI
NRM	HICOL	LOW COL	PLOT
LINE	REC	CIRCLE	ARC
ANGL	BLOCK	PAINT	DRAW
ROT	CHAR	TEXT	TEST
CSET	LEFT(scroll)	RIGHT(scroll)	UP(scroll)
DOWN(scroll)	BCKGNDS	FLASH	OFF
BFLASH	FCHR	FCOL	FILL
MOVE	INV	SCRSV	SCRLD
COPY	HRDCPY	DESIGN	@
CMOB	MOB SET	MMOB	RLOCMOB
DETECT	CHECK	MOB OFF	MEM
IF..THEN..ELSE	REPEAT..UNTIL	LOOP EXIT IF..	END LOOP
PROC	CALL	EXEC	END PROC
RCOMP	LOCAL	GLOBAL	NO ERROR
ON ERROR	OUT	WAVE	ENVELOPE
MUSIC	VOL	PLAY	SOUND
PENX	PENY	POT	JOY

RATING

Features	■■■■■
Presentation	■■■
Performance	■■■■
User interface	■■■■■
Reliability	■■■
Overall value	■■■■

Name Simons Basic **Application** supplementary Basic language including programmers' aid and graphics/sound features **System** Commodore 64 **Price** £50 **Publisher** Commodore **Format** Cartridge **Outlets** Commodore dealers.

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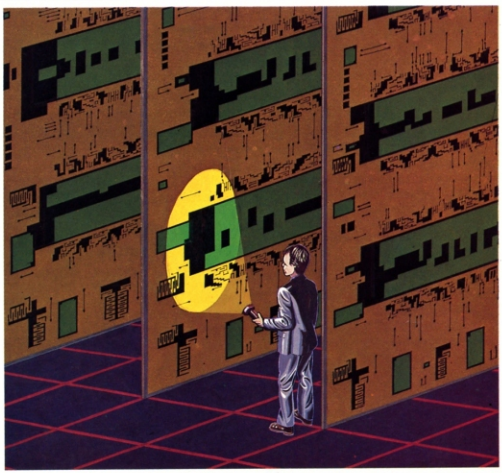
PC2

Max Phillips checks out three machine code monitors for the Oric 1. Each takes a different tack.



Robin Macfarlane

Three ways into the Oric

ORIC-MON

A monitor program used to be considered essential in any microcomputer. The Oric 1 is very much in need of one, particularly since the 'irritations' in its Basic tend to drive people to machine code much faster than with a normal machine.

Oric-mon from PSS is just the sort of program that should be buried away inside the ROM — a minimal way to write and debug machine code programs and explore the workings of the machine.

Features

This simple 2K monitor has all the usual stuff . . . dump and edit memory and registers, block move and search, breakpoints, a disassembler and a pleasant surprise — a 6502 relocator.

There's even a four-function hex calculator. It works with two byte values, though Oric-mon's conversion commands work only with single bytes!

The only serious omission is a line assembler. Everything has to be hand-assembled before entry . . . there isn't even a simple way to calculate relative branch displacements. Surely with the disassembler already in there, going the other way wouldn't be too difficult?

Getting started

Oric-mon is simple enough provided you know what you are doing. A neat box gives way to an unimpressive instruction sheet with more errors than you'd have thought possible in the space.

PSS seems not to have paid much attention to its documentation. Apart from typos and over-brief discussions, the author has got the D and H commands mixed up, and the up arrow just wouldn't work as described. In short, if you're not familiar with monitors, avoid this one.

In use

It's a fiddly program. Commands are single letters, mostly non-mnemonic, coupled with two or four digit hex numbers. Oric-mon is one of those pests that reads keypress-by-keypress, with only the right number of characters indicating that a command is complete.

So, to alter location 20, it's @0020, not @20 (return). It is workable and it certainly isn't unique, but there's room for proper command lines in a 2K monitor.

Neither is the program in a sensible position. Not just in the middle of nowhere, it's in the middle of the high-resolution screen. I used it to relocate itself, apparently with no ill-effects, but it's obvious that Basic and Oric-mon don't quite hit it off. I wouldn't like to try debugging a high-resolution program with this.

Oric-mon is a fat 2,400 bytes long and has the audacity to use up 64 precious zero-page bytes. Monitors should be used and not seen.

However, once you get the hang of it, you can get Oric-mon working quite nicely. The Oric certainly provides lots to explore. Debugging uncovered a few rough edges . . . block moves must move outside the range from which you are moving and the breakpoint facility is a bit limited. Beginners tend to prefer a step/trace, and Oric-mon's S to restart after a breakpoint misbehaved.

Verdict

A quick tidy-up and a second attempt at manual writing and Oric-mon would be very useful. Oric should have included this sort of program in the ROM, but as it stands, Oric-mon does provide some compensation.

Don't expect it to be much help with long machine code programs — buy an assembler for that. But seasoned 6502ers looking for a way into this new machine could find Oric-mon a suitable key.

Name Oric-mon **Price** £8.95 **System** 48K Oric 1 **Publisher** PPS, 452 Stoney Stanton Road, Coventry **Format** Cassette **Language** Machine code **Outlets** Mail order and dealers

RATING

Features	
Documentation	
Performance	
Usability	
Reliability	
Overall value	

ORION

Orion, from AWA software, is nearly a full-grown development system for the Oric 1. As well as being a monitor, it provides a full 6502 assembler. All it lacks is an editor — Oric Basic provides a crude substitute.

Features

The heart of Orion is its assembler. This is a full two-pass, and reasonably standard, program, although AWA has stuck with Oric's stupid # for hex convention. LDA #$2F actually comes out as LDA £#2F, the £ being Oric's ASCII 95.

It isn't luxurious though. There are six directives, ORG, END, DFB, DFS and

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DFS, and not much else. Even so, it's not bad for a cassette-based system.

Editing is handled by writing the source code as Basic program lines. Editing was never a strong point in Oric Basic, and you'll meet other problems with it trying to tokenise your assembler source. But this technique does save memory and you can, if you need to, shift your source code around in memory.

Once you have finished editing, ! takes you into Orion and you can assemble your code. There's a full-featured 2K monitor to help with debugging. You can dump, edit, move, search, fill and disassemble memory. There's a superfluous numeric conversion ability — Oric Basic will do the job!

Finally, a snazzy little breakpoint facility will pin down errant programs and go on to a single-step ability. Short and ever so sweet.

Getting started

Orion's 22-page manual is a bare minimum for this sort of tool. As with Oric-mon, Orion will suit those who know, but ambitious learners should be able to handle the challenge. At least there is enough documentation. Simple things like memory maps and the odd summary mean that Orion will fall easily into experienced hands.

In use

This is a utilitarian program. Single keypress commands are met with explicit, friendly prompts such as =,> or −. Failure to turn off the cursor (CTRL-Q) before starting the program ends in a series of blobs up the left of the screen. Unfortunately, the auto-repeat is disabled. Orion produces long outputs a line at a time, waiting for a keypress after each. Long listings to the printer could take a long time.

Orion loads quite low down in memory, resetting HIMEM to #7FFF for protection. Yet another undersized awkward little hole appears in the map (from #9538 to #9600). Fortunately, Orion avoids zero-page apart from #36 and #37, though the assembly does borrow a fair chunk.

It seems quite stable despite the necessity to leap in and out of Basic. The commands all work smoothly and assembly is fast enough. You can speed up the process by using the W command to reduce Orion's display to one or two lines.

I managed to dig up only one bug: a serious tendency for the disassembler to crash back into Basic with a bizarre NEXT WITHOUT FOR message.

Verdict

Orion is a mature little package. Nothing glamorous, but a practical way of getting into machine code on the Oric. If you are looking for a complete development tool and can take the odd rough edge, Orion is odds-on favourite.

Name Orion **System** 48K Oric 1 **Price** £12.95 **Publisher** AWA software, 50 Dundonald Road, Didsbury, Manchester M20 0RU **Format** Cassette **Language** Machine code **Outlets** Mail order

RATING

Features			■
Documentation			■
Performance	■	■	■
Usability			■
Reliability			■
Overall value			■

MICROPLOT E/A/D

Editor/Assembler/Disassembler from Microplot is probably the most bizarre development tool ever to make it to tape. It is a big Basic program with a little machine code, and just doesn't work like any package I've ever seen.

Features

The Microplot E/A/D is an attempt to integrate all the tools into one system. Assembly takes place on entry directly into memory, though symbols are allowed as you can edit a symbol table separately.

Obvious problems are that it's a pain to insert lines of code and you can't have comments. The manual suggests you handwrite them on a printout or just copy out the whole source code onto photocopies of a coding sheet included with the package. No comment!

The disassembler is, under these circumstances, quite clever. It manages a symbolic disassembly, using the symbols that are currently defined. The rest of the monitor is virtually useless.

You can dump memory in a very untidy hex format . . . no ASCII option. A move command is provided basically to allow source lines to be inserted. This overwrites the original memory location with #EAs (NOP — no operation codes) for no good reason.

A 'Z' command calls this routine halfway through to let you NOP out any block of memory. Dead useful! There are apparently no single step, trace, breakpoint or even register examine facilities.

Getting started

E/A/D is supplied in two fast copies and loads in the shabbiest way possible. First the machine code, then stop the tape and CLOAD "ASSEMBLER". Why isn't the code buried in the Basic program?

The manual is somewhat illiterate, and very unhelpful. It leaves little clue as to what the package actually does and it lacks vital information on how E/A/D uses memory.

In use

E/A/D is a nice idea, but it doesn't work. There's no way you can attempt this sort of package in Basic, as it's too slow and too unstable. Saving your source code, for example, involves quitting the program and restarting it — frequently losing your code.

Basic errors crept in everywhere. I got everything from ILLEGAL QUANTITY, OUT OF MEMORY to SYNTAX ERROR — all while trying to get to know the package. It could take years to develop a program with it. E/A/D even uses those awful non-standard mnemonics that the rest of the world got rid of years ago. Remember LDAX and CPYIM? No help whatsoever, especially for newcomers.

Verdict

This isn't a serious tool. It's good as a gimmick, or for frightening the neighbours, but it just wouldn't be right for anyone used to or learning machine code. The only possible value is that Microplot has tried to implement a rather interesting and novel approach.

Name Editor/Assembler/Disassembler **System** 48K Oric 1 **Price** £15 **Publisher** Microplot, 19 The Earls Croft, Cheylesmore, Coventry CV3 5ES **Format** Cassette **Language** Basic and machine code **Outlets** Mail order and selected dealers

RATING

Features			■
Documentation			■
Performance			■
Usability			■
Reliability			■
Overall value			■

Summary

Orion is definitely king of this bunch. It provides a full assembler as well as a competent monitor. Its price is worth the extra, as newcomers and experts alike will benefit from its more mature facilities.

Tansoft has advertised its own Oric-mon (stand by for name confusion) and copies will be available shortly for around £15.

	Oric-mon	Orion	E/A/D
Memory used	#A800-#B180	#8000-#9538	Basic
Alter memory	Hex or ASCII	Hex	Hex
Dump memory	Hex and ASCII	Hex or ASCII	Hex
Base conversion	Hex-Dec Hex-Bin	Hex-Dec Dec-Hex	No
Calculator	★ − + /	No	No
Disassembler	Yes	Yes	Yes, symbolic
6502 assembler	None	standard 2-pass	non-standard
Block move	Yes	Yes	Yes
Fill	Yes	Yes	With NOPs
Relocate	Yes	No	No
Search	Hex or ASCII	Hex	No
Breakpoint	up to 8	1	No
Single step	No	Yes	No

Right ribbon, right paper for your printer, safe disks — Barry Miles tells you how to keep . . .

A clean machine

As soon as you begin serious use of a piece of computer equipment you start wondering whether you might be able to make some improvements to your methods of operating. It's surprising how soon we take yesterday's novelty for granted and look for today's. Taking printers as an example, how can you best go about selecting accessories to enhance the capability of a printer, and to make sure that we get the best out of it in any given application?

Well, you might look at the selection of paper. At first sight there is nothing to this, you simply buy a box of 66-line paper, and that's it. But is it? You may need to do word-processing, and 72-line paper with strippable perforations may be what you require. This is sold as A4, but does not quite match those dimensions.

Then there is the question of how many sheets to a box, and the weight of the paper. The usual for the industry is to have 2,000 sheets in a box of paper, or 1,000 if it is two part paper, and 700 if it is three part. If you don't know what all this emphasis on 'parts' is all about, read on.

If you look through the catalogues of the stationery suppliers, you will see the legend OTC and NCR attached to the papers listed. One Time Carbon is interleaved with the paper and, as its name suggests, is perfectly effective carbon paper, provided it is discarded after one use and you do not attempt to use it for other purposes, such as putting it through your typewriter. No Carbon Required paper is impregated with chemicals, so that when the papers are crushed together by the action of the print-head, you obtain a duplicate or triplicate image on the lower papers.

Paper chase

Choosing between these two alternatives is not easy. On the one hand, One Time Carbons are mucky things to handle when you try bursting apart the stationery, and they are bulky and cause a disposal problem. On the other hand, No Carbon Required paper has recently been held responsible for both respiratory and skin complaints.

Choosing the right weight of paper is also tricky. The weights are identified in another mysterious code, GSM, which turns out to mean grammes per square metre. Common-or-garden listing paper is often 50 or 60 GSM, but for prestigious work you will want 85 or even 100. A word of warning, however — these heavier weights are bulky and stiff, and will possibly not go into those carefully selected envelopes you chose for your mailshot once you have folded the letter. Furthermore, tests are necessary with your printer, because you may find that the sprockets are not substantial enough to carry the paper reliably.

Then we come to the ruling on the paper. Plain paper is fine, but many people find that they suffer from astigmatism (squint!), and need the help of the music ruled paper, which comes in a natty shade of green. If you find this unattractive, you may wish to contact Inmac (09285 67551) and have a look at the company's special paper with broad green bars on it, which is unfortunately available only in the 132-column width at the moment.

This is a pity, but with cheap daisywheels becoming available, there will be many more potential users of this paper. The broad green bars are alternated with white ones, three lines each, and this makes for easy reading. If you don't find this attractive, Inmac also markets a paper 66 lines long by 80 columns wide which has feint horizontal lines. This is very good for easy reading, and has the additional advantage of helping you to make legible notes on it!

Getting fancy

If you want to get really fancy, and are willing to spend about double the price for your paper, you can have not only genuine A4 size paper, but micro-perforations as well. These are really remarkable, since they are so fine that tearing off the sheet is very simple, and recipients would be very unlikely to notice that the document had been printed by a computer. This is not cheap, but business people who feel that their letters are their shop window may well feel justified in going for the new Streamprint service.

For about 5p a sheet you can have your letterhead in this material, including a logo if you wish, all in five days, and send out extremely impressive-looking letters. This sounds expensive, and so it is, but it is worth considering that good word-processor systems can now be bought very cheaply, so if you pay £200-300 for a computer, under £100 for a program, and £250 for a disk drive, you may feel that the addition of a £500 daisywheel printer and some fancy paper at £170 for 2,000 sheets is a worthwhile expenditure.

Inmac's catalogue is always an interesting read. It comes out every two months and frequently has new and highly innovative products in it. In the field of paper, for instance, it offers trolleys to move it about on, trays to hold up to 132 column printout — some of which even fit on top of your VDU — and special perforated transparent tape to enable you to reinforce the edges of stationery which you have filed or are about to file.

All printer-users ought to pay some attention to cleaning their machines. Not merely wiping a duster over the outside, but actually doing something about dust and tiny paper fragments which drop into the machine after you have enthusiastically torn off the paper.

The neatest arrangement I have come across is provided by Triumph Adler with its daisywheel printer. It comes with a duster and a brush which is covered in a sticky substance, and you waft this around inside the machine.

The more obsessional cleaners of printers will be tempted by the kit obtainable from Inmac, which contains solutions, wands, brushes and wipes, together with ten pairs of disposable gloves.

Alternatively, what about the typeface cleaner which you can use easily? This is a special type of paper which you put through your printer with the ribbon removed. This is of course only suitable for daisywheels. Another possibility is the Daisy Wheel Bath. You pop the wheel into a sealed container, turn the knob round ten times, and a special fabric pad will clean your wheel in 30 seconds. So if you've £16.50 to spare, then off you go.

Still on printers, what about the ribbons? Now there is some controversy over whether you should use other manufacturer's replacement ribbons in your dot matrix printer. There is a theory that if you buy cheap ribbons you will be in danger of damaging the print-head because of inadequate lubrication.

You will usually find that the printer manufacturer's own replacement ribbons are appreciably more expensive than the ones supplied by other outfits, so it may well be cheaper to burn out the print-head. If you are looking at this seriously, it will pay you to find out how cheaply and easily you can fit a new print-head!

You may even be tempted to fit new ribbons inside the cartridge in which you received your original ribbon. This is a good money-saver, if somewhat dirty. You are sometimes supplied with a single plastic glove for this operation: in my experience you will need two!

Some real money-saving enthusiasts will go for the ultimate: re-inking the ribbon.

Disks

Looking at disks for a moment, just consider the economies which might be effected here: First the grade of disk to use on your equipment is the one which works satisfactorily. There is no point in double-density disks, if you find that single density disks work. I have put 500K of data onto single-sided single-density disks with no problems.

It's worth being really scrupulous about keeping your disks clean and dust-free, and in proper containers. The prices of these containers are now low enough to be really affordable: if you can afford the

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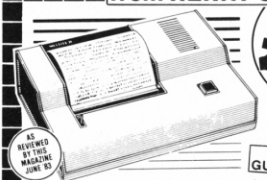

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PCN 25/8

drive and the disks, you can afford the box.

If you want to do things on the cheap, then have a look at the SEE 10 library box from Disk King (0428 722563). This holds ten disks, but falls open wide so that the disks are really visible. These are £2.50 each or free (together with a directory and diskwriter pen), with every box of ten disks.

The best one I have come across is made by MC of Wimbledon and sold by both Inmac and Action of Alperton.

You attach small hooks onto the sides of the envelope in which the disks arrived, and you can insert these into the box easily with one hand. The disk cannot fall out because of a clever retaining bar system which is locked at the flip of a switch. Tipping the box upside-down does not do any harm, and you have a set of dividers, a set of numbered labels, and a card index into the bargain. There is even space for a spare box of disks at the back of the box.

For around £35 this is difficult to resist. As supplied, it stores up to 40 disks, and an optional extra kit stores 40 more.

If you want something smaller, you might choose the Inmac flip top desk-file, which holds up to 50 disks, or its really sturdy flip binder which will hold up to 20 floppies in an accessible way. A bit pricey at £33 but a real time-saver.

I do not recommend the use of disk head-cleaners. None of the disk drive problems I or my friends have experienced over a number of years using microcomputers has been attributable to dirty heads — the lining of the disk seems to give all the cleaning necessary.

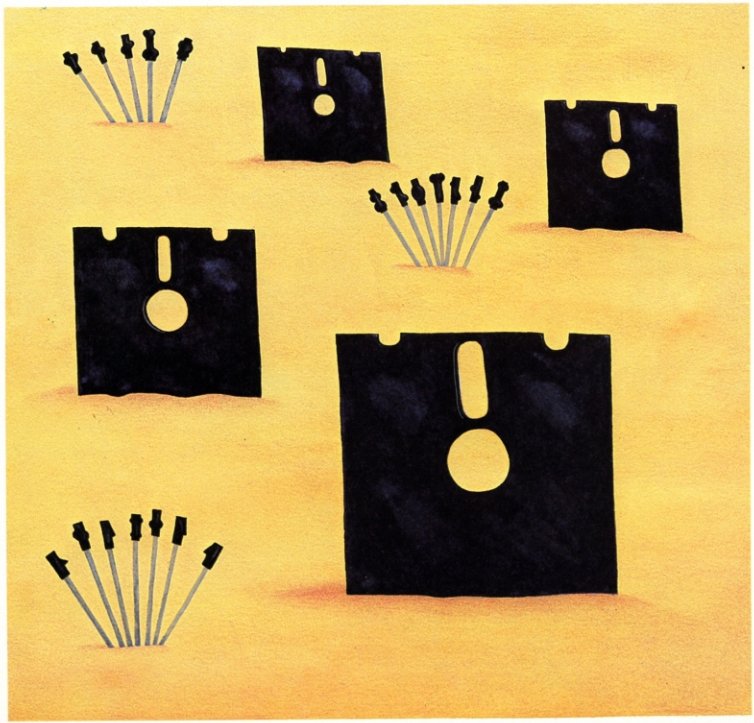
Odds and ends

Finally what about foot-rests and wrist-rests? These and a number of other surprising goodies are in the Inmac catalogue.

If you are after something rather less fancy than Inmac provides in the way of papers, and you are around the North London area, check out prices with D W (Direct Wholesale) at Kingsbury (0121 205 3476). If you collect the paper yourself, it works out very cheap. Alternatively, Action, at Alperton (01 903 3921), supplies an increasingly wide range of branded accessories for printers and disk drives at competitive prices. If you get the catalogue, which comes out every four months, you will be amazed to see that no carriage charge is made for cash with order, or credit card telephone orders. Since paper is heavy, this is very good news. They also make the proud boast 'You order by five, we despatch by six'.

Other items of interest are anti-static kits, sturdy IEEE and RS232 cables with moulded connections, which seem virtually indestructible, and a good printer-stand with a basket to catch the paper, for only £22.

A word of warning: Do not overstock with ribbons — they dry out in storage and have a limited shelf-life. If you can buy from people with a fast rate of turnover, you have more hope that the goods have not been on their shelves too long.



The new Commodore 64 is the most powerful personal computer available to the businessman.

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A brilliant example of micro-computer technology, it will do a lot to make your business more efficient and more profitable.

The range of software – general and specific – is very extensive, and covers financial planning, word processing, information handling and countless other business and personal tasks.

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A Commodore 64 at home could allow you access to all the information stored at your company office immediately, easily and with complete security, simply by linking up to any TV set or monitor.

For the office. Or the

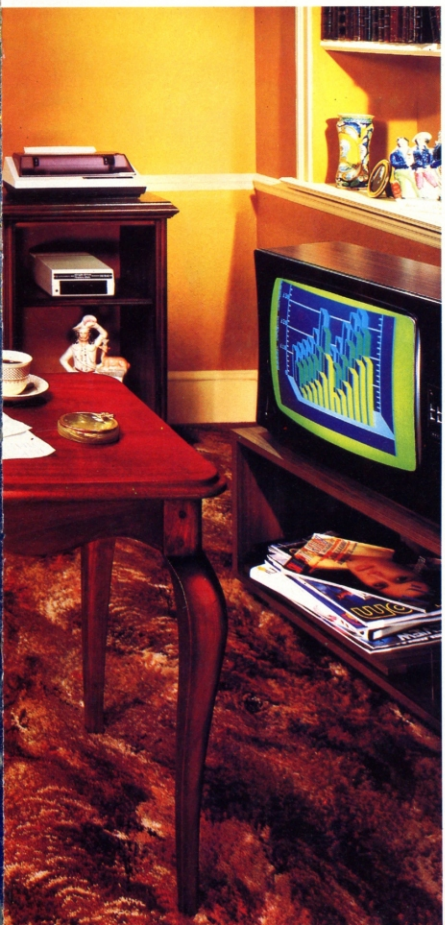
ELECTRONIC MAIL IN MICROSECONDS

You could also link up with other Commodore 64s: in branch offices, for example, or in colleagues' homes, with instant exchange of information.

You could also plug in to half a million pages of Prestel information, making use of key figures in combination with your own calculations for such statistics as you might need; or for other business uses, like car hire and hotel bookings.

The Commodore 64 means maximum flexibility,

home office.



and provides the facts on which you can base sound business decisions.

INVALUABLE TO ANY BUSINESS

The Commodore 64 is the perfect computer for your own business, whatever its size. As well as the advantages we've already mentioned, it has a great capacity for expansion, and when combined with various peripherals** it is superbly flexible. Whether it's looking after personnel records or creating models, say, for sales forecasts, it will quickly prove to be of vital importance to any well run concern.

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Microdrives are a powerful addition to the Spectrum. Ian Scales engages the dark side of the force.

Hard driving

The story so far. . . In *PCN, issue 23*, we looked at the hardware of the Microdrives and some of the features offered by Sir Clive's latest brainchild.

However, there are many other aspects to what is undoubtedly one of the most important developments in microcomputing this year.

Documentation

One of the first things that became apparent in actually using the Microdrives was that the manual is rather inadequate, to say the least.

It takes just 57 pages to cover all of the different features offered by both the Microdrive system and its networking facilities.

Some of the chapters are frankly breathtaking in their lack of detail.

One of the most crucial concepts with which you must get to grips, having added the Interface 1, is streams and channels. This is granted a meagre two pages, although the concepts appear constantly through the rest of the manual.

The channels are the places in the system to and from which you and the computer send data — off to the screen, printer, Microdrive, RS232 or other Spectrum, or from the keyboard, Microdrive, RS232 with a modem, or other Spectrum on the net.

The streams are the routes along which data flows to and from the channels. The first four streams are linked to various components — the upper or lower parts of the screen, the keyboard or the ZX printer. This leaves streams four to 15 free to the user for sending data to Microdrive files or other computers on the net.

When using the networking facilities you have to differentiate between data and programs. While sending a program across the net is a fairly straightforward task, sending data involves a little more fiddling about.

Because the net uses a 255 byte buffer system, there must be a close stream statement at the end of the data to tell the buffer to send off the last block, even though (254 times out of 255) it hasn't been filled.

The same concepts are involved in manipulating data files with the Microdrives. You have to 'open' a stream and nominate the file name. The cartridge concerned is then searched and, depending on whether the file named exists already, is opened for reading (if it is) or is created (if it isn't).

All well and good: these features present no unsurmountable problems. But the chapter entitled 'Data and the Network', for instance, is just one and a half pages long!

There is only one short demonstration program and the terseness of the explanation reveals, perhaps, a mind so used to dealing in bits and bytes that it's forgotten the average user can't 'SAVE' with the same efficiency as the Microdrive itself.

Reliability

Or can it? Much as I'd like to be overwhelmingly effusive in welcoming what appears to be a revolutionary product, I have to say that I'm a bit dubious about reliability.

Obviously at this stage it pays to give Sinclair the benefit of the doubt. Until large numbers of drives are out in the hands of the public it's difficult to tell how often such and such a feature is going to break down and under what circumstances.

But I did experience a disappointing number of faults. One of the Microdrives I was using seemed to develop a formatting fault.

Formatting always takes a fairly long time, because the system has to go right through each cartridge several times to write checksums, read them back and identify blocks. One of the drives I used set off the formatting routine and didn't come back — it just kept going for several minutes. Here lies a problem: to stop the berserk Microdrive required pulling the plug — an action specifically prohibited by the manual.

On other occasions the same drive would achieve the format operation after a couple of minutes, with a count of the available space in kilobytes. Unfortunately it returned a pathetic figure of 6K and then 4K of available space. The manual says you should never have less than 85K free after a format.

But the same cartridge on the same interface in a different drive came back with 97K free.

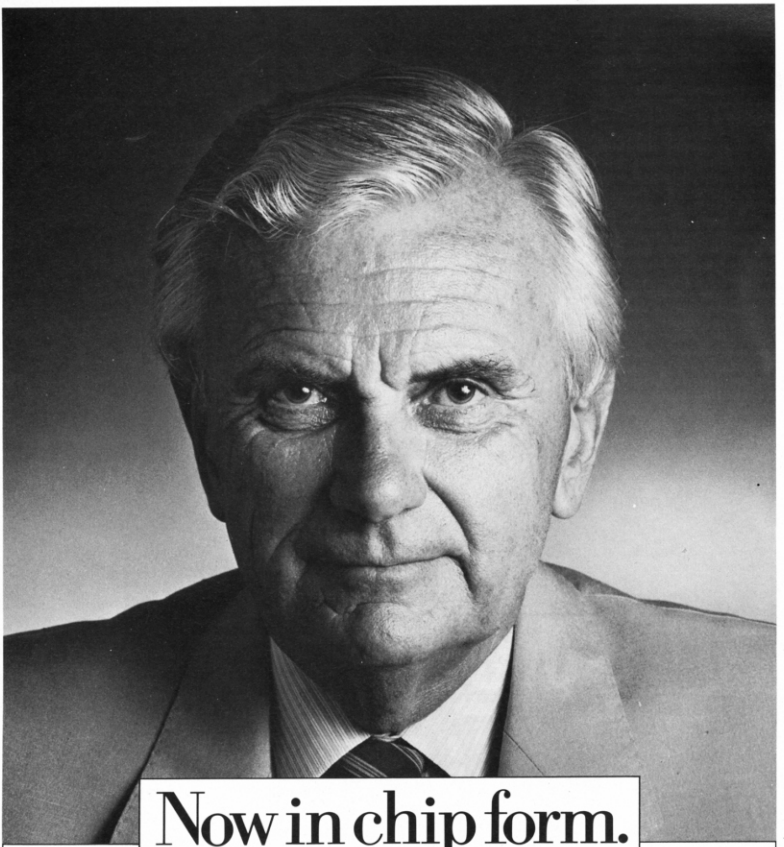
Interfacing

Another problem was encountered when trying to configure an RS232 printer to the interface. Put quite simply, it didn't work (yes, I followed the instructions in the manual). I'm sure it can work, because I saw it doing so at the Sinclair launch, but the point is that users are going to have problems when trying to do it themselves. After all, if Sinclair sells Microdrives and interfaces in kilo-volumes the company is hardly equipped to deal with the flood of user-enquiries which seem bound to follow.

This is all a bit of a shame, because most of the problems seem to relate back to the shortcomings of the manual. One might almost imagine that the documentation offered is part of a conspiracy to sell an additional 'Getting to grips with the Microdrive' — type book at some later stage.

All I can say is that somebody is going to have to write one. And there'll be a market ready and waiting . . .

Catherine Denver



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Called Speech Synthesis, it's a pair of chips that can be plugged into your BBC Micro by your local BBC/Acorn dealer. On them, you'll find 164 words/syllables spoken in familiar fashion by the famous retired newscaster, all of which can be combined to form several hundred other words.

The chips also provide the 'serial' processing capability whereby future software cartridges can also be plugged into the front of your BBC Micro. (The machine's vocabulary will be widened via such cartridges.)

Priced £55, Speech Synthesis is available from your local BBC/Acorn dealer. (To find out where that is, simply call 01-200 0200.)

If you'd like more information, he'll complete the story. In plain English, of course.

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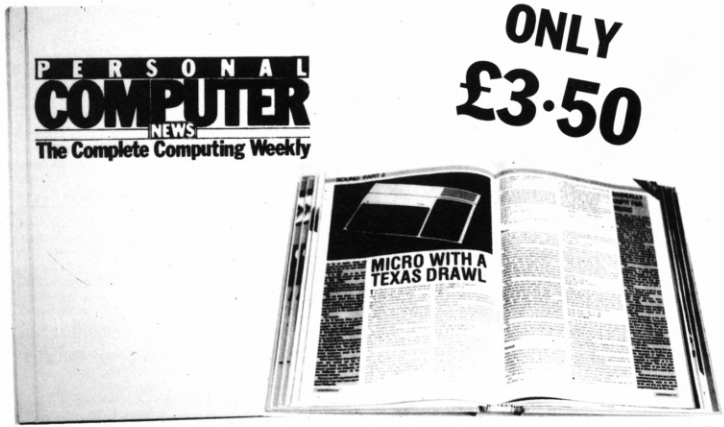

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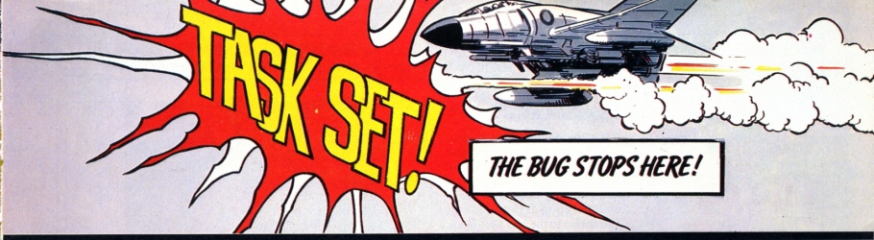

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ALIEN ECOLOGY

Life on Contra

You dimly remember winning the planet Contra's semi-millennial lottery. You recall that the prize was the honour of serving as Contra's Central Mentality, your duty being to ensure the survival of life on the planet. You bring to mind that day they froze your body deep within the underground complex and connected your brain to the computer network, the day your life was suspended for 500 years.

Objectives

This is the imaginative setting for Infocom's latest adventure, Suspended — aptly subtitled A Cryogenic Nightmare. You have been roused from suspension to cope with a critical imbalance in Contra's three filtering computers, the controllers of the planet's life-support systems. However, in your semi-suspended state, the only way you can resolve the emergency is by issuing commands, via the filtering computers, to six idiosyncratic robots.

Each of these named robots has a unique set of characteristics. Auda is your ears, Iris your eyes and Sensa a mixture of sensory apparatus. Waldo is for manipulating objects, Whiz is an interfacing device, allowing you access to the Core's indices, technical and historical information, and expert advice. Poet (you'll love this android) is a zany, purple-prosed diagnostic computer. He sees and describes the world around him in speech that is unlike anyone else's, robot or human.

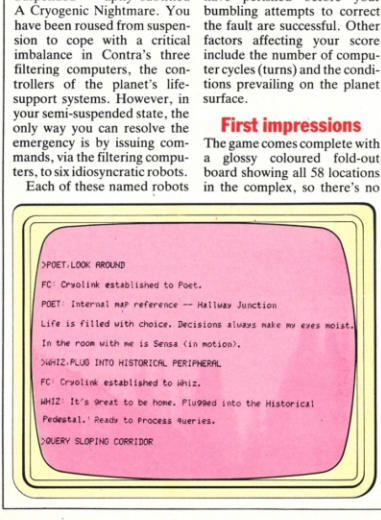
As in all Infocom adventures, commands can be given in a variety of formats. You can talk to one or more robots at the same time.

You are given little idea of what caused the emergency, only that some connecting cabling between the Filtering Computers has been damaged and that you must repair it quickly. As the Filtering Computers control the weather, food production and transportation systems, you don't need a computer to guess the effect a malfunction would have on Contra's life-style.

Your performance is therefore chiefly measured in terms of how many of the population have perished before your bumbling attempts to correct the fault are successful. Other factors affecting your score include the number of computer cycles (turns) and the conditions prevailing on the planet surface.

First impressions

The game comes complete with a glossy coloured fold-out board showing all 58 locations in the complex, so there's no need to make a map. Six individually scribed rubber markers are supplied for your use in tracking the robots' whereabouts. Background, commands, information, and examples are supplied in a large-format booklet. Together with the disk, the whole package comes in an eye-catching box whose front depicts in relief a frozen face.



In play

First you should try to get the hang of each individual robot's character, perception and attributes. Move them around the complex to see how they react and how they can best be used. You can move a robot long distances by simply telling it to head for a particular place — it will report back when it gets there.

Become familiar with the complex and what each of the 58 areas holds. Have a peep at the weather monitors, the decontamination chamber and the cryogenic area. Try interrogating the Central Library Core via Whiz and the pedestals. Learn how to repair the robots when they malfunction. Pay particular attention to the various interrupts that your robots and the Filtering Computers will make.

Don't worry about your score on the first few attempts — you'll have more than enough to cope with!

Apart from the utter strangeness of trying to feel your way around an alien environment through the medium of six other personalities, there is another factor to think about. It seems your predecessor woke up prematurely one morning, found no emergency, so set about creating his own. One of his jollier japes was to cause the Taxi-Robots in the transportation system to seek out and run down hapless pedestrians. An extermination squad took care of him, but some of his handiwork still lies within the complex, not the least of which is a mangled, heavy-duty robot which had been 'attended to' by your potty precursor.

When you do eventually succeed in completing a game, you can always try to beter your score. There are also three greater challenges for you to attempt: Advanced, Configure and Impossible.

Advanced is a much more time-intensive version of the same game, while Configure allows you to select your own starting positions and factors. You can place the robots in any location (or even have them out of action), set the cooling and surface systems timing, etc. This way you can set up all sorts of problems for you (or friends) to overcome.

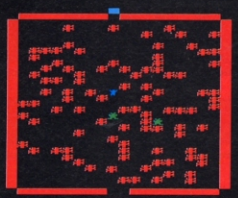
Impossible is impossible — anyone completing this version gets an all expenses paid trip to Contra!

Verdict

This is a highly original, hugely enjoyable adventure. It's a bit more difficult than the usual breed, but has all the qualities that go to make good adventures so darned addictive. It has humour, imagination, challenge, and it's different. A winner all the way. It's enough to make the competition want to go into suspended animation for 500 years! **Bob Chappell**

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	



JUNGLE TREK

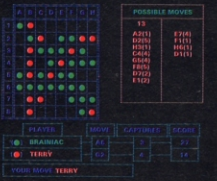
Progress through twenty Jungles avoiding the chasing wild animals which increase with each Jungle. Gain additional points by collecting the golden eggs. Survival depends on your skill at avoiding capture. There are three levels of skill.

BATTLETANKS

Two tanks supported by troops hurtle through a maze of buildings, blasting barricades and missile launchers. Chase and fire at your opponent in this strategic game of warfare. Be careful of being ambushed.

YANGTZE

An intriguing and addictive game of skill and chance. Three versions are available. The first of which enables up to five players to participate. The second involves the computer playing itself and the third variation is designed to test your skill against the computer.



REVERSI

A game of skill, fast moving with dramatic changes of fortune. A traditional board game with the object of capturing opponents pieces and having the majority of your own left at the end. Computer assisted play is available if required. Play against the computer or another player. A demonstration game is played by the computer.

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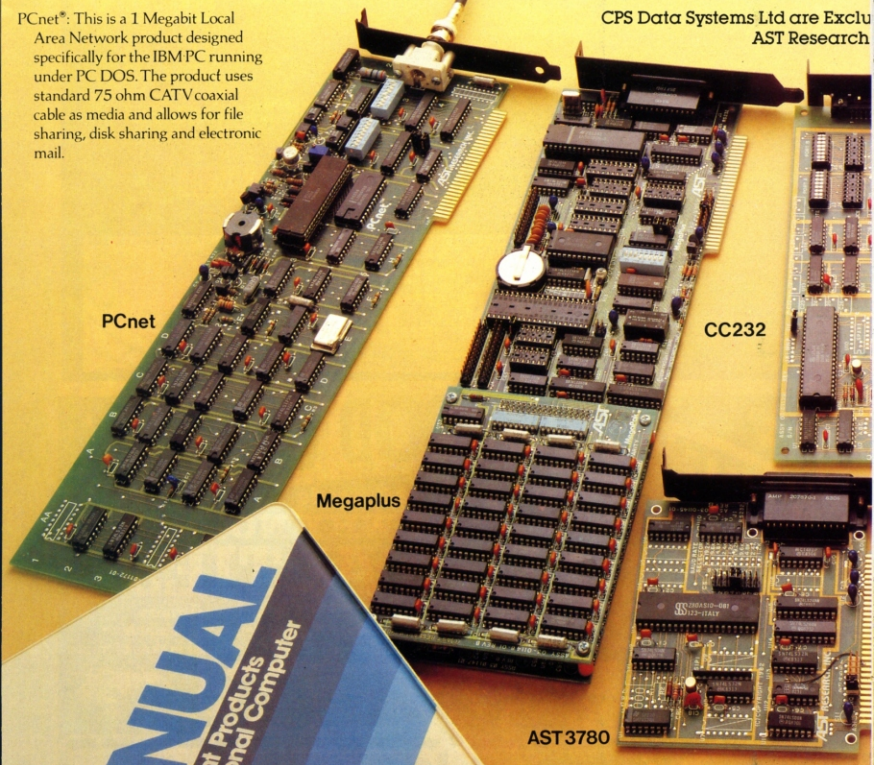

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SPECTRUM ARCADE

ZX SPECTRUM

Into the valley . . .

Name Terror-daktil **System** Spectrum **Price** £6.95 **Publisher** Melbourne House **Format** Cassette **Outlets** most retail, mail order.

You've probably never really thought about what you'd do if you were stranded in the South American jungle, being attacked by flying lizards, and with nothing to defend yourself but three rusty old cannon. No? Well, we now have the chance to get a bit of practice.

Objectives

Terror-daktils comes from Melbourne House, which brought us the Hobbit, and the flying lizards in question do bear more than a passing resemblance to Smaug. You've been stranded in the valley time forgot after a plane crash, and you have to fend off 3D pterodactyls whose sole aim seems to be to . . . ah, land on you and stun you? Even killer lizards seem to be more user-friendly these days . . .

In play

Once you've got through the plane crash and dawn breaking graphics — both very good — you see a 3D representation of a river valley, with your crashed plane to one side and a smouldering volcano in the distance. Up by the volcano the Terror-daktils are massing for the attack.

You use one of your three cannon to pick them off as they come at you, and if you can last for six days, help arrives. The cassette sleeve claims you use a battered old pistol, and indeed you can whip your armoury along the bottom of the screen as if it was a pistol, but it's quite clearly a very large field gun.

You can move the cannon back and forth along the bottom of the screen, and change the elevation of the gun, so you can theoretically hit any point on the screen.

Fairly frequently one of the little blobs on the horizon peels off from the formation and, as it gets closer, turns out to be a very natty 3D pterodactyl heading straight for you. You get more points if you can hit one while it's swooping, but it's a lot safer dodging it and sticking to knocking off the ones parked up by the volcano.

If you slip up and one of the beasts lands on you, you're stunned for the rest of the day, and one of your three cannon is bent. If you can survive for six days, you've won.

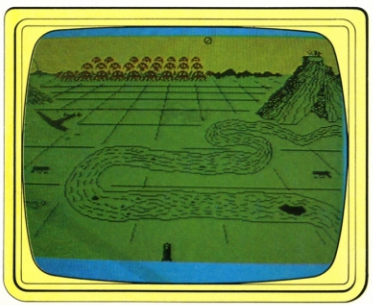
Verdict

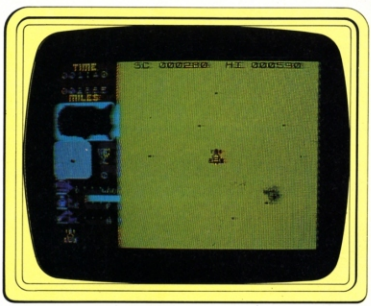
The game's worth having for the graphics alone, but in addition to this it's good because it's a more thoughtful version of the invaders-type game. It doesn't move too fast, and you rely heavily on your powers of anticipation to survive.

John Lettice

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	





ZX SPECTRUM

Miles of trials

Name Transam **System** 16K and 48K Spectrum **Price** £5.50 **Publisher** Ultimate Play the Game **Format** Cassette **Language** Machine code **Outlets** Most retail, mail order.

Far into the future, nuclear war has devastated the world. The cities are silent, shattered, and you are all that's left of civilisation. Well, all apart from the sinister black racers, the gas stations, and your own souped-up racing car with its fuel gauge, engine temperature gauge, speedometer and radar and map reading equipment. Ho hum, back to nature . . .

Objectives

The game has a main screen, which shows your car and the local sights — the odd tree, cactus or rock, helpfully captioned Denver, San Diego etc. You can steer in any direction you like across this screen, which scrolls through a much larger map — represented on the left of the screen — showing you as a little flashing light moving across the USA. Gas stations, which you should visit frequently in order to keep the tiger in your tank, also appear.

Your quest is to find the eight cups of Ultimate — just what you need to rebuild civilisation — while avoiding the black racers. These home in on your engine-noise and crash into you.

In play

Besides the aforementioned screens, you also have a local radar screen on which to keep an eye. This shows you if there are any hostiles or golden cups in the area. The black racers seem to be faster than you are, and while you break if you hit an object — tree, rock, cactus — they bounce.

You can lose them for brief periods by swerving, or by steering in among clumps of trees, but they soon pick up your trail again. It's theoretically possible to keep an eye on all three screens at once, if you have three eyes, but us mere mortals are reduced to driving by the seat of our pants, dodging trees and black racers.

The borders are a further hazard. When you get near Canada, Mexico or the sea, you seem to bounce off, so tourism is clearly out. I did try to see the Everglades, but the rubber band seems to be fixed right at the North of Florida.

Verdict

Transam is an original idea, and makes a challenging game. It's difficult to get far into it without a joystick, although there is provision made for one, and even then you've got to be fairly nippy. Getting fuel or picking up one of the cups is difficult, as prudence dictates that you should pick them up without stopping. There's also plenty of scope for developing little manoeuvring wrinkles for your continued survival. It certainly isn't a game you'll tire of quickly.

John Lettice

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

YEP FOLKS — IT'S HERE

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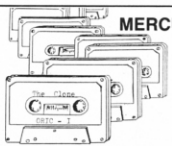

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Kathryn Custance fights her way through hordes of Dragon games and picks a few to review.

Dragon packs invade

There are now a fair number of games for the Dragon. *PCN* has picked a mixed bag at random and after a bit of rummaging around we've come up with half a dozen 'typical' packages.

BACKGAMMON

As the sound of leather against willow goes straight to the heart of a cricketer, so the click of tumbling dice rouses the spirit of the backgammon player.

Much of the pleasure in playing backgammon lies in the equipment itself. And so shrinking the rather elegant board and shoving it onto a screen takes away a lot of the enjoyment of the game.

It is also simpler and quicker to pick up and move a counter than to instruct a computer to do it for you. Having said that a micro can be a useful friend for the solitary backgammon fiend.

This game is best played by those who already know the rules as they are not included with the package. There are various skill levels, so in theory you should be able to improve your game. As a backgammon aficionado, playing against the computer was a bit of a doddle.

Reproducing a backgammon board on a screen is difficult to do attractively and imaginatively and this company doesn't try. Unless you have a very large television you will find the combination of little counters and lines a bit of an eyestrain. When it comes to the computer's go I kept getting lost, as it is difficult to work out which counters have been moved.

In general the game is worth getting if you are a novice wanting to polish up your skills before you hit the big time. But if you are a serious player you will find the game loses a lot of its sparkle.

CONCENTRATE

Do you remember the hours of fun you used to have turning over playing cards to find pairs? I always remember this game, 'Pelmanism', as being possibly the most boring card game invented.

To confuse the public Mk1 has renamed the game Concentrate, which makes it more interesting. But in fact the game is even more boring than the card version as instead of having a pack of 52 cards to choose from there is only room on the screen for 28. The players take it in turns to turn over two cards by tapping a number between 1 and 28 to correspond with the cards position. The winner is the person with the most pairs at the end of the game. I can't see the point of buying this card game unless you want to improve a young child's memory powers and ability to recognise patterns and numbers.

GAMES PACK 1

Games packs are always a good idea, especially if you tire of individual games quickly. There's always a great sense of value for money, and even if the quality of games is not that good, eight games for the price of one cassette can't be bad.

There are four traditional games on the cassette: 10 Pin Bowling, Micropoly (a micro version of Monopoly), Noughts and Crosses and Mastermind (the coloured peg board game). There is also a memory game called Simon, a problem solving game, King of the Valley, an adventure style game, Wells of Omicron, and an arcade type game, Muncher.

Although none of these games are original or particularly exciting they are all quite good fun to play, particularly for the younger users. It is pleasing to see a balanced mixture of games. There should be at least one game in the pack which interests each Dragon user.

PARK OF DEATH

This was my favourite game of the bunch. It has variety and it combines all the best elements of a good game. The object of the game is to make your way across the Park of Death, sticking to the pathway. You have the options of going north, south, east or west, but you can't get very far without meeting an obstacle.

You only have one life so if you fail to pass the obstacles you die.

I won't give away too much of the game, but the sort of problems you come across are finding keys, meeting a rather unpleasant egotistical android, doing simple addition sums and having a go on the dodgems. I didn't make it through the park alive but if you keep your wits about you I'm sure it's possible.

A good game, with nice graphics — worth the money.

EMPIRE

Another 'Conquer the World' game, good for megalomaniacs and strategists. You need to read the instructions carefully before you start, otherwise you will find it very confusing. I always think it is better to put as many instructions in the game as possible, but the problem with this one is that there is so much happening on the screen that it would probably only add to the confusion.

To start the play you select 13 territories on a world map and the Dragon, your opponent, does the same. You then allocate your armies and start attacking each other. There is a constant progress chart on the screen so you can tell what's happening and there are eight levels of difficulty.

This game needs quite a lot of concentration and you will probably need to play it several times before you get the hang of it. I found it bewildering.

DRAGON TREK

This is another game where you really need to get a good grasp of the instructions before you load the cassette. You are the captain of the starship Enterprise and you have a five-year mission to seek and destroy all enemy vessels throughout the galaxy.

There's a lot going on in this game and it will take you a bit of time to master your weapons and command options. I found the graphics rather confusing and half the time I couldn't really understand what was happening. But to an experienced space traveller it is probably quite good.

Concentrate, Park of Death, — Mk1 Software, 30 Painswick Road, Birmingham B28 0HF
Backgammon £8 — Microdeal, 41 Truro Road, St Austell, Cornwall 0726)67676 **Games Pack 1** £650 — Abacus Software, 21 Union Street, Ramsbottom, near Bury, Lancashire 0204-383839 **Empire** £6.95 — Wintersoft, 30 Uplands Park Road, Enfield, Middx 01-363 0313
Dragon Trek — Shards Software, 189 Eton Road, Ilford, Essex IG1 2UQ

AT THE HOP

ORIC

Road runner

Name Jogger **System** 48K Oric 1 **Price** £6.95 **Publisher** Severn Software, 5 School Crescent, Lydney, Gloucestershire GL15 5TA **Format** Cassette **Language** Basic and machine code **Outlets** Mail order and dealers.

I'm not convinced Jogger is a major contribution to road safety. This Severn Software cassette for the 48K Oric is, of course, Frogger. How many joggers do you know who leap logs and crocodiles and live in frog's nests?

Objectives

Same old story. All you have to do is make a mad dash across a busy road, hop a few crocodiles and logs across a busy river and pop your man home.

Jogger has a time limit for each bloke and you get an extra one should you be persistent enough to make 20,000 points.

In play

Jogger is neatly presented. Clear instructions, one slow and two fast auto-run copies make it easy to get going.

It has a messy 'hall of fame' and a cumbersome series of yes/no questions between each game. Missing Y for 'Another game?' dumps you in Basic without a cursor and with a mucked up character set. There's no obvious way to restart it.

The graphics are distinctly jerky during play though you get a smooth scroll whenever you get a man home. Your jogger doesn't look much like a jogger and the beasties in the water are also a bit odd.

Movement is by the cursor keys and is suitably responsive. The only real problem is that the traffic has an American look to it. It appears to be glued together, and even the crocodiles seem to be whizzing along at 55mph. I hung around for a bit, waiting for the inevitable pile-up so I could stroll across, but no such luck . . .

Once I'd sense it was easy to learn the gaps in the traffic. My best way was to stand in the middle and wait for the two green metros. Run like mad to the middle of the westbound lane. Let the lorry go by. Take three steps and wait for the croc. Works every time!

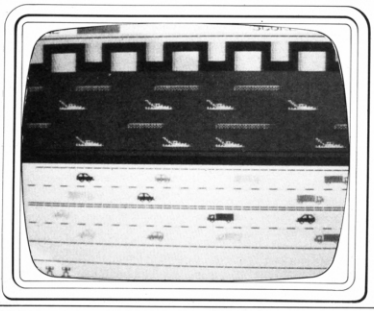
Still there are subtleties. You get fifty points for every move you make. So, if you've got time left, you can hop back and forth from log to croc just to knock the score up. And getting into the first 'box' isn't easy.

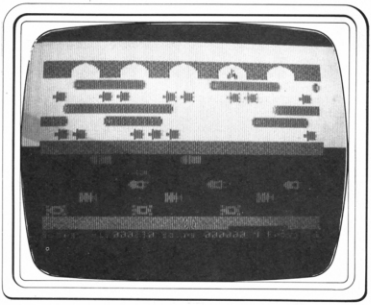
Verdict

Jogger isn't a bad version of a rather unoriginal game. But it has no new twists or fun. And it won't take long to master. Still, once you're bored with it there's plenty of scope for more of the same . . . Dogger, Sogger, Togger, Mogger . . . the possibilities are endless.

Max Phillips

RATING	
Lasting appeal	
Playability	
Use of machine	
Value for money	





IBM PC

Toad runner

Name Frogger **System** IBM PC with colour graphics adaptor **Publisher** Sierra On-Line, Coarsegold, California **Format** Diskette **Outlets** SBD Software, 15 Jocelyn Road, Richmond, Surrey 01-870 9275.

Sega has put its popular leaping game Frogger on the IBM PC. It's the same concept as the arcade version, where you move a frog vertically, horizontally, left to right past obstacles to get the slimy green creature back home.

Objectives

You've to get several frogs across a busy highway without getting run over and across a river without falling in. But, watch out for the deadly snakes, otters and diving turtles who'll try and get you. And if that's not enough to compete with you've also got to beat the clock by getting your frog safely home in 120 beats.

There are three levels of play — normal, advance and expert. If you play a normal game you get five frogs to play with and if you play advance or expert you only get three.

In play

Ready to jump off, the options menu came on the screen. First of all I redefined the keys for easier play and chose my skill level.

Now picture a busy street in the West End of London — I'll use the same tactics. Wait for a break in the traffic, then shoot across like a bullet. You've got to get the timing right. Several times my frogs ended up as corpses.

The next obstacle is to cross the river. You need good finger co-ordination for this bit.

By stepping over turtles, snakes and other watery creatures you can dock your frog safely home.

The turtles do have a tendency to disappear as you land on them — thus resulting in your frog falling in with a big splash.

The way frogs drown in Frogger has always puzzled me . . . If the turtles can handle water, why can't I?

On several occasions I scored a few bonus points by beating the timer, gobbling an insect or getting home safely. Your highest score, your present score and the number of frogs you have left is continuously displayed.

And during play by using the function keys you can alter the sound, pause the action and make the graphics a bit clearer by changing the background colour select.

Verdict

After you have learnt to master this hopping game, you should have no problems in scoring high points.

There are several options of play and this gives a bit of variety. Frogger will keep you entertained for a few hours or so — but whether you'll want to keep going back to it or not depends on whether you get hooked. I certainly didn't.

Sandra Grandison

RATING	
Lasting appeal	
Playability	
Use of machine	
Overall value	

PCN ProgramCards

ProgramCards, this week, sees the completion of 'SURROUND' for the BBC(B) and two new programs are started this week. The first is a game for Atari machines, the second an educational program for the Lynx 48K.

A trip round Europe

Yes, at last we have a Lynx program. This, from Christopher Wood, of Norfolk, could be a help to anyone considering travelling the Continent this year, assuming that they own a Lynx of course. The program uses the Lynx graphics to draw maps of nine European countries. It is written so that countries may be added or left out at will, since each country is drawn with a separate routine. The countries are selected from a menu at the beginning of the program.

Don't miss next week's issue for the remainder of this listing.

A walk in the park

The Atari program this week is from Noel Daniel, of London. It gives you the chance to apply for a job as park keeper (the name of the game).

To get the job you need to collect at least ten leaves from each field. The number of leaves is set in line 350 and the number of lines available per field in line 200. Thirteen leaves are originally put on the field to allow the giant moth to eat a few. The broken bottles, which give the park keeper mortal wounds if stepped on, are set in line 160. The moth moves randomly by the subroutine in lines 180-1110. Beware of this moth — it is very partial to job-applicants!

The time allowed for each field is set in line 120. If you want to work overtime try altering this value.

Sorry, our mistake

As ZX81 users who tried the Display Dump routine given in the ProgramCards of issue 23 will have noticed, some errors crept into the listing. Lines 3 and 9000 were at fault — they should have been:

```
3 DIM P$(6,792)
9000 LET A$="2A 10 40 11 06 00 19 ED 5B
 OC 40 01 18 03 ED BO C9"
```

A RUN for our money

We pay for published programs on a sliding scale which take into account length, complexity, originality and the programming skill demonstrated in the program. So why not give us a RUN for our money?

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Send your contribution, on disk or cassette, together with a plain paper listing and brief summary notes to:

The Programs Editor, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

All disks and cassettes will be returned as soon as possible after evaluation or publication, at our expense.

PCN ProgramCards

BBC(B)/BBC Basic/Taylor/Continued

Surround Card 5 of 8

8325Su5/8

```
1360IF X1%<64 THEN X1%=1200
1370LEFT2%=POINT(X1%+6,Y1%-16)
1380IF LEFT2%=0 OR LEFT2%=1 THEN X1%=X1%+H%:GOTO 1700
1390IF var2=1 AND X1%=1200 THEN 1700
1400ENDPROC
1410IF A2%=1 THEN1580
1420A2%=2
1430X1%=X1%+H%
1440IF X1%>1200 THEN X1%=64
1450RIGHT2%=POINT(X1%+8,Y1%-16)
1460IF RIGHT2%=0 OR RIGHT2%=1 THEN X1%=X1%-H%:GOTO1700
1470IF var2=1 AND X1%=64 THEN1700
1480ENDPROC
1490IF A2%=4 THEN1420
1500A2%=3
1510Y1%=Y1%-H%
1520IF Y1%<90 THEN Y1%=942
1530DOWN2%=POINT(X1%+8,Y1%-16)
1540IF DOWN2%=0 OR DOWN2%=1 THEN Y1%=Y1%+H%:GOTO1700
1550IF var2=1 AND Y1%=942 THEN1700
1560ENDPROC
1570IF A2%=3 THEN1340
1580A2%=4
1590Y1%=Y1%+H%
1600IF Y1%>950 THEN Y1%=92
1610UP2%=POINT(X1%+8,Y1%-16)
1620IF UP2%=0 OR UP2%=1 THEN Y1%=Y1%-H%:GOTO1700
1630IF var2=1 AND Y1%=92 THEN1700
1640ENDPROC
1650play2%=play2%+1
1660REM SOUND
1670PROCscore
1680IF play2%=10 THEN DS%=1:ENDPROC
1690GOTO 1740
1700play1%=play1%+1
1710REM SOUND
```

1360-1400	Check for player two's move left
1410-1480	Player two's move right
1490-1560	Player two's move down
1570-1640	Player two's move up
1650	Player two wins a point
1660	Insert a sound routine
1670	Display new score
1680	If player two has won display the fact at 270
1700	Player one wins a point

ViSions

Visions makes major breakthrough in video games war

Chiswick based Visions is moving into the video games market in a big way with a new range of exciting and radically different games.

The games, which include Pitman 7, Sheer Panic and Visions Snooker are being marketed by
young company which
a really major impa
challenging worl

Visions managing director, Sean de Bray, explains: "We're using a new pool of highly imaginative young pr ers who are just bursting wi s for revolutionary dif-

constantly recruit
eir gifts
ial and
e."

Stop press — Lightning Strikes

Visions have signed a major distribution deal with Prism Microproducts and Lightning Records to ensure that everyone has a chance to try their video games. Over 2000 retail outlets throughout the UK now stock Visions products — and there are more to come!

Jon Burnham

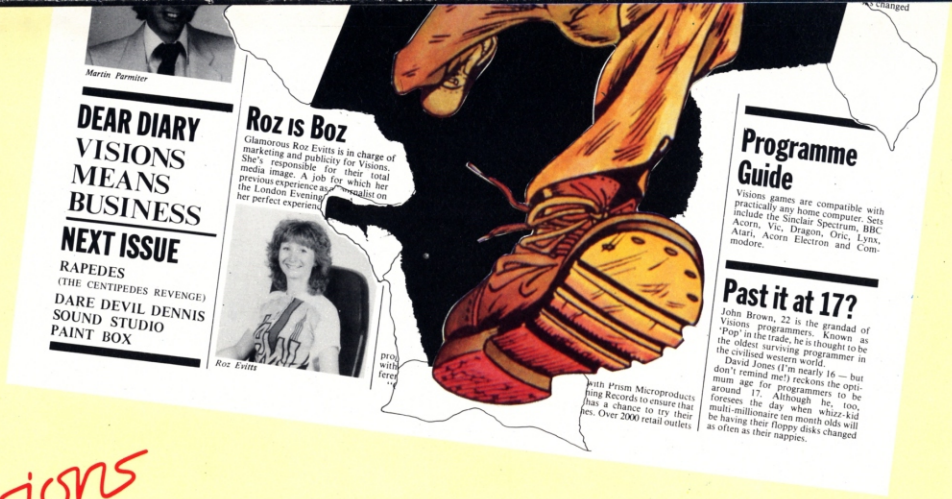
Chrome, Sweet Chrome

From the start, Visions took the decision that all their games would be reproduced only on chrome tape.

"This way" says Martin Parmiter, "we can ensure that our tapes have a lower failure rate than any others on the market."

"This is due to our unique tape reproduction facility developed from our previous company, Datafone", says co-director Jon Burnham, who was actually responsible for the tape duplication machines.

Sean de Bray



Visions

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PITMAN SEVEN VS-01-48


SHEER PANIC VS-02-16


SNOOKER VS-03-1'4

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Surround Card 6 of 8

8325Su6/8

```
1720PROCscore
1730IF play1%=10 THEN DS1%=1:ENDPROC
1740F=TIME+150:REPEAT:UNTIL TIME>F
1750DD%=1:ENDPROC
1760DEFPROCscore
1770VDU4:CLG
1780 PRINTTAB(5,1);play1%
1790PRINTTAB(14,1);play2%:VDU5:ENDPROC
1810DEFPROCalpha
1820L%=RND(10):IF L%<>1 THENENDPROC
1830IF Cc%=1 THEN Cc%=3:GOTO1870
1840IF Cc%=2 THEN Cc%=3:GOTO1870
1850IF Cc%=3 THEN Cc%=2
1860IF Cc%=4 THEN Cc%=2
1870IF X%>500 THEN alp=1
1880ENDPROC
1890DEFPROCmoveC
1900IF alp=0 THEN PROCalpha
1910IF Cc%=1 THEN 1970
1920IF Cc%=2 THEN 2060
1930IF Cc%=3 THEN 2150
1940IF Cc%=4 THEN 2240
1950IF Y%<90 THEN Y%=942
1960IF Cc%=1 THEN 1650
1970X%=X%-H%
1980IF X%<64 THEN X%=1200
1990LC%=POINT(X%+6,Y%-16)
2000IF var2=1 AND X%=1200 THEN X%=64:GOTO2140
2010IF LC%=0 OR LC%=1 THEN X%=X%+H%:GOTO2130
2020Cc%=1
2030ENDPROC
2040IF Y%>950 THEN Y%=92
2050IF Cc%=2 THEN1650
2060X%=X%+H%
2070IF X%>1200 THEN X%=64
2080RC%=POINT(X%+8,Y%-16)
```

1720 1730	Display the score If player one has won, display the fact at 200
1760-1800	Display the current score
1810-1880	Randomly change computer's direction if not at edge of screen
1890 1900 1910-1940	Make computer's move If not at the edge of screen, change the direction Move in the direction set
1950-2030	Computer's move left. Check game type and wrap around
2040-2080	Computer's move right with checks

PCN ProgramCards

Surround Card 7 of 8

8325Su7/8

```
2090IF var2=1 AND X%=64 THEN X%=1200:GOTO2230
2100IF RC%=0 OR RC%=1 THEN X%=X%-H%:GOTO2220
2110Cc%=2
2120ENDPROC
2130IF X%>1200 THEN X%=64
2140IF Cc%=3 THEN1650
2150Y%=Y%-H%
2160IF Y%<90 THEN Y%=942
2170DC%=POINT(X%+8,Y%-16)
2180IF var2=1 AND Y%=942 THEN Y%=92:GOTO2050
2190IF DC%=0 OR DC%=1 THEN Y%=Y%+H%:GOTO2040
2200Cc%=3
2210ENDPROC
2220IF X%<64 THEN X%=1200
2230IF Cc%=4 THEN1650
2240Y%=Y%+H%
2250IF Y%>950 THEN Y%=92
2260UC%=POINT(X%+8,Y%-16)
2270IF var2=1 AND Y%=92 THEN Y%=942:GOTO1960
2280IF UC%=0 OR UC%=1 ,THEN Y%=Y%-H%:GOTO1950
2290Cc%=4
2300ENDPROC
2310DEFPROCchoice2:CLS
2320FORT=1 TO2:PRINTTAB(8,T);CHR$(141);CHR$(129);"SURROUND
    CHOICE?":NEXT
2330PRINTTAB(0,4);"PRESS EITHER YOUR FIRE BUTTON ON YOUR"
2340PRINT"JOYSTICKS OR THE SPACE BAR, DEPENDING"
2350PRINT"WHETHER YOU WANT TO USE THE JOYSTICKS"
2360PRINT"OR THE KEYBOARD TO PLAY SURROUND"
2370REPEAT
2380A=INKEY(-99):IF A=TRUE THEN key1%=1
2390JL=ADVAL(0) AND 3
2400IF JL=2 THEN key1%=2
2410UNTIL key1%=2 OR key1%=1
2420ENDPROC
```

2090-2120	Continue checks on computer's move right
2130-2210	Computer's move down plus checks
2220-2300	Computer's move up plus checks
2310-2420	PROCchoice 2: clear screen, print a menu giving the option of joystick or keyboard

PCNProgramCards

Surround — Card 8 of 8

8325Su8/8

```
2430DEFPROCchoice
2440VDU4:CLS
2450FORT=1 TO2:PRINTTAB(8,T);CHR$(141);CHR$(129);"SURROUND VARIATIONS":NEXT
2460PRINTTAB(5,4);"2 PLAYER GAMES"
2470PRINTTAB(0,6);CHR$(131);"(1) TRAIL LEFT : LIMITED TO SCREEN"
2480PRINTTAB(0,8);CHR$(131);"(2) OPTION ON TRAIL : LIMITED TO SCREEN"
2490PRINTTAB(0,10);CHR$(131);"(3) TRAIL LEFT : ABLE TO TRAVEL OFF"
2500PRINTTAB(0,11);CHR$(131);"SCREEN"
2510PRINTTAB(0,13);CHR$(131);"(4) OPTION ON TRAIL : ABLE TO TRAVEL"
2520PRINTTAB(0,14);CHR$(131);"OFF SCREEN"
2530PRINTTAB(5,17);"1 PLAYER GAMES"
2540PRINTTAB(0,19);CHR$(131);"(5) LIMITED TO SCREEN"
2550PRINTTAB(0,21);CHR$(131);"(6) NOT LIMITED TO SCREEN"
2560BA=GET:VDU5
2570IF BA<49 OR BA>54 THEN2450
2580IF BA=49THEN var=1:var2=1:ENDPROC
2590IF BA=50THEN var=0:var2=1:ENDPROC
2600IF BA=51THEN var=1:var2=0:ENDPROC
2610IF BA=52THEN var=0:var2=0:ENDPROC
2620IF BA=53THEN var=1:var2=1:var4=1:ENDPROC
2630IF BA=54THEN var=1:var2=0:var4=1:ENDPROC
2640DEFPROCagain
2650FORT=1 TO2:PRINTTAB(8,T);CHR$(141);CHR$(129);"SURROUND AGAIN?":NEXT
2660PRINTTAB(0,4);CHR$(130);"PRESS THE BUTTON ON YOUR JOYSTICK OR"
2670PRINTTAB(0,5);CHR$(130);""Y"" IF YOU WISH TO CONTINUE PLAYING"
2680PRINTTAB(0,6);CHR$(130);"THE SAME OPTION"
2690PRINTTAB(0,7);CHR$(130);" TYPE ""N"" TO QUIT FROM THE PROGRAM"
2700PRINTTAB(0,9);CHR$(136);CHR$(130);"TO CHANGE THE OPTION YOU ARE"
2710PRINTTAB(0,10);CHR$(136);CHR$(130);"YOU ARE PLAYING PRESS ESCAPE"
2720REPEAT
2730JK=ADVAL(0) AND 3:DF$=INKEY$(0):IF DF$="N" THEN 2750
2740UNTIL JK=2 OR DF$="Y" OR DF$="y":ENDPROC
2750CLS:FORR=10 TO 11:PRINTTAB(10,R);CHR$(141);CHR$(129);"BYE!.........":NEXT:
END
```

2430-2630	PROCchoice: Print game selection menu and set up the variables for the chosen game type	2640-2750	PROCagain: Offer player option of another game

PCNProgramCards

Park Keeper

8325PK1/5

Atari 400/800
Atari Basic

Application: Game
Author: Noel Daniel

```
10 GRAPHICS 1+16
20 POSITION 4,11:? #6;"PLEASE WAIT":GOSUB 1120:? #6;CHR$(125)
30 POSITION 5,0:? #6;"park keeper"
40 POSITION 6,6:? #6;"O BOTTLE"
50 POSITION 6,8:? #6;"X  MOTH "
60 POSITION 6,10:? #6;"Z  LEAF "
80 POSITION 1,20:? #6;"please press start"
90 IF PEEK(53279)<>6 THEN GOTO 30
100 ? #6;CHR$(125)
110 LEAVES=0:SCREEN=0
120 TIME=80
125 IF SCREEN=11 THEN GOTO 840
130 X=10:Y=20:MX=10:MY=5
140 M1C=35:M2C=36:LC=122:MC=216:BC=241
150 POKE 709,34:POKE 711,15:POKE 710,1:POKE 712,198:POKE 708,44
160 FOR NOBOT=1 TO 20
170 COLOR BC
180 PLOT INT(RND(1)*18)+1,INT(RND(1)*18)+1
190 NEXT NOBOT
200 FOR NOL=1 TO 13
210 COLOR LC
220 PLOT INT(RND(1)*18)+1,INT(RND(1)*18)+1
230 NEXT NOL
```

10	Select graphics mode, without text window	90	Check to see if the start key has been pressed	130-140	Set more variables
20	Perform character redefinition	100	Clear screen	150	Select screen colours
30-80	Title page	110-120	Set variables	160-190	Plot 20 random bottles
		125	Check for end of game	200-230	Plot 13 random leaves

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PCNProgramCards

Park Keeper Card 2 of 5

8325PK2/5

```
240 GOTO 980
250 GOSUB 450
260 LOCATE X,Y,CRASH
270 IF X<=1 THEN X=1
280 IF X>=18 THEN X=18
290 IF Y<=1 THEN Y=1
300 IF Y>=20 THEN Y=20
310 IF CRASH=LC THEN GOSUB 500
320 IF CRASH=MC THEN 530
330 IF CRASH=BC THEN 610
340 IF TIME=0 THEN GOTO 690
350 IF LEAVES=10 THEN SCREEN=SCREEN+1:GOTO 770
370 COLOR M1C:PLOT X,Y:FOR TUNE=1 TO 8:SOUND 1,255,4,10:NEXT TUNE:FOR WAIT=1 TO
3:NEXT WAIT
380 COLOR M2C:PLOT X,Y:FOR WAIT=1 TO 8:NEXT WAIT
390 COLOR 0:PLOT X,Y:SOUND 1,0,0,0
400 COLOR 0:PLOT MX,MY
410 TIME=TIME-1
420 POSITION 0,20:? #6;"TIME ";TIME;" "
430 POSITION 0,21:? #6;"LEAVES ";LEAVES
440 GOTO 240
450 IF STICK(0)=14 THEN Y=Y-1
460 IF STICK(0)=13 THEN Y=Y+1
470 IF STICK(0)=11 THEN X=X-1
480 IF STICK(0)=7 THEN X=X+1
490 RETURN
500 FOR TUNE=30 TO 60:SOUND 0,TUNE,10,10:NEXT TUNE:SOUND 0,0,0,0
510 LEAVES=LEAVES+1
520 RETURN
```

240	Move Moth	350	Check to see if 10 leaves have been collected	450-490	Joystick and man movement subroutine
250	Check for joystick movement				
260-300	Check for man off screen	370-400	Plot man on screen	500-520	Collect leaf subroutine
310-330	See if man has crashed into anything	410	Decrease time by one		
		420-430	Print current time and leaves		
340	Check for time out	440	Repeat from line 240		

PCNProgramCards

Park Keeper Card 3 of 5

8325PK3/5

```
530 GRAPHICS 1+16
540 POSITION 5,2:? #6;"game over"
550 FOR TUNE=0 TO 255:SOUND 0,TUNE,12,10:NEXT TUNE:SOUND 0,0,0,0
560 POSITION 0,5:? #6;"YOU CRASHED INTO THEMOTH AND DIED"
570 POSITION 2,10:? #6;"you collected ";LEAVES1*SCREEN+LEAVES;"      leaves"
580 POSITION 1,20:? #6;"PLEASE PRESS start"
590 IF PEEK(53279)<>6 THEN 590
600 POKE 756,A/256:GOTO 100
610 GRAPHICS 1+16
620 POSITION 5,2:? #6;"game over"
630 FOR TUNE=0 TO 255:SOUND 0,TUNE,12,10:NEXT TUNE:SOUND 0,0,0,0
640 POSITION 1,5:? #6;"YOU CRASHED INTO A BROKEN BOTTLE AND   DIED"
650 POSITION 2,10:? #6;"you collected ";LEAVES1*SCREEN+LEAVES;"      leaves"
660 POSITION 1,20:? #6;"PLEASE PRESS start"
670 IF PEEK(53279)<>6 THEN 670
680 POKE 756,A/256:GOTO 100
690 GRAPHICS 1+16
700 POSITION 5,2:? #6;"game over"
710 FOR TUNE=0 TO 255:SOUND 0,TUNE,12,10:NEXT TUNE:SOUND 0,0,0,0
720 POSITION 0,5:? #6;"YOU RAN OUT OF TIME"
730 POSITION 2,10:? #6;"you collected ";LEAVES1*SCREEN+LEAVES;"      leaves"
740 POSITION 1,20:? #6;"PLEASE PRESS start"
750 IF PEEK(53279)<>6 THEN GOTO 750
760 POKE 756,A/256:GOTO 100
770 ? #6;CHR$(125)
```

530-580	End game—Man eaten by Moth	670-680	Check for start key and restart game	770	Clear screen
590-600	Check for start key and restart game	690-740	End game—Man ran out of time		
610-660	End game—Man killed by broken bottle	750-760	Check for start key and restart game		

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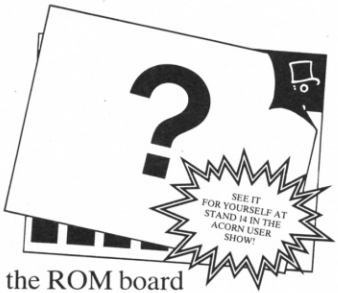

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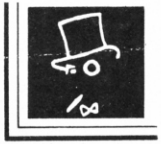

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PCNProgramCards

Park Keeper Card 4 of 5

8325PK4/5

```
780 POSITION 2,2:? #6;"CONGRATULATIONS"
790 FOR AGAIN=1 TO 5:FOR TUNE=70 TO 100:SOUND 0,TUNE,10,10:NEXT TUNE:NEXT AGAIN:
SOUND 0,0,0,0
800 POSITION 0,5:? #6;"you cleared field ";SCREEN
820 FOR WAIT=1 TO 600:NEXT WAIT
830 ? #6;CHR$(125):LEAVES1=LEAVES:LEAVES=0:GOTO 120
840 GRAPHICS 1+16:OPEN #1,4,0,"K:"
850 POSITION 2,0:? #6;"CONGRATULATIONS"
860 FOR AGAIN=1 TO 5:FOR TUNE=255 TO 0 STEP -3
870 SOUND 0,TUNE,12,10:NEXT TUNE
880 NEXT AGAIN:SOUND 0,0,0,0
890 POSITION 0,5:? #6;"YOU COMPLEATED ALL  ";SCREEN;" FIELDS "
900 POSITION 2,9:? #6;"you collected        ";LEAVES1*10;"   leaves"
910 POSITION 0,13:? #6;"THE SUMMER HOLLIDAYSARE OVER AND YOU ARE    A QUALIFIED
      PARK KEEPER"
920 POSITION 1,20:? #6;"PLAY AGAIN?  (Y/N)"
930 GET #1,P
940 IF P=ASC("Y") THEN GOTO 970
950 IF P=ASC("N") THEN GOTO 1210
960 GOTO 930
970 POKE 756,A/256:GOTO 100
980 MOVE=INT(RND(1)*4)+1
990 IF MOVE=1 THEN MY=MY-1
1000 IF MOVE=2 THEN MY=MY+1
1010 IF MOVE=3 THEN MX=MX-1
```

780-820	Congratulate man on getting leaves	840-910	Congratulate player on getting all 10 fields	980-1020	Get a random number and move Moth accordingly
830	Clear screen and update number of leaves collected then restart game	920-960	Another game?		
		970	Redefine characters and run game		

PCNProgramCards

Park Keeper Card 5 of 5

8325PK5/5

```
1020 IF MOVE=4 THEN MX=MX+1
1030 LOCATE MX,MY,ZZ
1040 IF MX<=1 THEN MX=1
1050 IF MX>=18 THEN MX=18
1060 IF MY<=1 THEN MY=1
1070 IF MY>=19 THEN MY=19
1080 IF ZZ=35 OR ZZ=36 THEN GOTO 530
1090 COLOR MC:PLOT MX,MY:FOR WAIT=1 TO 10:NEXT WAIT
1100 REM
1110 GOTO 250
1120 DATA 5,24,60,60,24,255,60,60,38,96,32,60,60,24,255,60,60,100,6
1130 DATA 392,60,24,24,52,82,74,102,52,448,66,36,153,219,255,126,219,129
1140 DATA 464,6,26,59,119,119,63,22,32
1150 A=(PEEK(106)-8)*256
1160 FOR I=0 TO 1023:POKE A+I,PEEK(57344+I):NEXT I
1170 RESTORE 1120:READ NUMBER
1180 FOR I=1 TO NUMBER:READ ADDR:FOR J=0 TO 7
1190 READ Z:POKE A+ADDR+J,Z:NEXT J:NEXT I
1200 POKE 756,A/256:RETURN
1210 GRAPHICS 2+16
1220 FOR D=1 TO 40:SOUND 0,200,10,10:POSITION 5,5:? #6;"OOOOO":NEXT D
1230 FOR D=1 TO 30:SOUND 0,255,10,10:POSITION 10,5:? #6;"KKK!!";NEXT D:SOUND 0,0
,0,0
1240 FOR WAIT=1 TO 200:NEXT WAIT
1250 END
```

1030-1070	Check if Moth has left screen	1120-1200	Redefine characters
1080	Check if Moth has eaten man	1210-1250	End of game
1090	Plot Moth on the screen		
1110	Return to game		

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PCN ProgramCards

Euro Atlas — Card 1 of 6

8325EA1/6

Lynx 48K
Lynx Basic

Application: Education
Author: Christopher Wood

```
50 WINDOW 3,123,5,245
51 CLS
55 VDU 25,1,2
60 PRINT "1.GREAT BRITAIN"
70 PRINT "2.FRANCE"
71 PRINT "3.SPAIN&PORTUGAL"
72 PRINT "4.E.&W.GERMANY&DENMARK"
73 PRINT "5.SWITZERLAND&AUSTRIA"
80 PAUSE 5000
90 PRINT "Select the No. of the map you
require"
91 LET X=GETN
100 IF X=49 THEN  GOTO 190
110 IF X=50 THEN  GOTO 1000
120 IF X=51 THEN  GOTO 2000
130 IF X=52 THEN  GOTO 3000
140 IF X=53 THEN  GOTO 4000
190 CLS
195 VDU 1,2
200 PRINT  @ 61,0;"GREAT BRITAIN"
210 PRINT  @ 61,10;"-------------"
220 VDU 1,4
221 RESTORE 270
225 MOVE 6,192
230 FOR Z=1 TO 63
240   READ A,B
250   DRAW A,B
255   BEEP 400,10,65000
260 NEXT Z
270 DATA 24,176,28,168,44,168,48,164
280 DATA 24,158,20,160,14,152,32,144
290 DATA 32,132,24,134,30,128,26,124
300 DATA 30,120,32,124,48,126,46,118
310 DATA 52,104,46,108,40,96,46,86
320 DATA 38,90,22,88,30,76,26,72
330 DATA 14,78,24,50,18,54,16,50
340 DATA 22,36,20,34,24,22,28,22
350 DATA 32,8,54,10,40,26,44,26
360 DATA 40,32,68,30,58,62,46,66
370 DATA 62,68,70,96,86,108,90,130
380 DATA 86,134,92,138,92,134,100,134
390 DATA 106,136,110,146,104,160,92,164
400 DATA 98,168,104,168,104,174,88,182
410 DATA 80,180,56,182,40,180,32,190
420 DATA 26,186,12,192,6,192
421 MOVE 0,150
```

50-55	Set screen and colour		position
60-140	Select map	230-260	Read coordinate data and plot
190-220	Map of Great Britain. Set screen and title		map
		270-420	Data for England, Scotland and Wales
221	Reset data marker		
225	Position graphics cursor to start	421	Position graphics cursor

PCN ProgramCards

Euro Atlas — Card 2 of 6

8325EA2/6

```
422 FOR D=1 TO 8
422.1   READ A,B
424   DRAW A,B
424.1   BEEP 400,10,65000
424.2 NEXT D
425 DATA 14,134,12,118,20,110,16,102
426 DATA 12,106,14,96,10,84,0,84
428 VDU 1,2
430 PRINT  @ 0,210;"Do you require more
imformation? Y/N"
440 IF GETN=78 THEN  GOTO 670
445 VDU 1,2
450 FOR V=1 TO 16
460   READ U,I
470   MOVE U,I
490   DRAW 120,10+(V*10)
495   BEEP 200,10,65000
500 NEXT V
510 DATA 34,68,48,70,12,106,66,88,48,120
520 DATA 56,120,72,110,66,114,66,122
530 DATA 60,142,42,162,102,140,50,164,
540 DATA 84,164,36,180,64,180
550 VDU 1,1
560 WINDOW 61,123,16,245
570 VDU 23
580 FOR N=1 TO 16
590   READ N$
600   PRINT N$
610 NEXT N
620 DATA 1.GLASGOW,2.EDINBURGH,3.BELFAST
,4.NEWCASTLE
630 DATA 5.LIVERPOOL,6.MANCHESTER,7.YORK
640 DATA 8.LEEDS,9.SHEFFIELD,10.BIRMINGH
AM
650 DATA 11.CARDIFF,12.NORWICH,13.BRISTO
L
660 DATA 14.LONDON,15.EXETER,16.SOUTHAMP
TON
665 VDU 1,2
670 PRINT  @ 0,210;"Do you require anoth
er country? Y/N          "
680 IF GETN=78 THEN  GOTO 10000
690 GOTO 50
1000 CLS
1010 VDU 1,2,25
1020 PRINT  @ 61,0;,"FRANCE"
1030 PRINT  @ 61,10;,"------"
1040 VDU 1,4
1045 RESTORE 1110
1050 MOVE 108,126
1060 FOR Z=1 TO 40
1070   READ A,B
1080   DRAW A,B
1090   BEEP 400,10,65000
1100 NEXT Z
```

422-424	Draw Ireland	510-540	Data for label lines (Britain)	620-660	Data for British towns
425-426	Data for Ireland	560	Set window	670-690	More countries? option
430-440	Option for extra information	580-610	Read and print towns in the window	1000-1100	Same as Great Britain but for France
450-500	Read data and draw label lines				

Continued next week

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Clubnet keeps you in touch with micro enthusiasts throughout the UK. It is divided into clubs and user groups and a list of each is published on alternate weeks.

This week it is the turn of user groups, which are listed alphabetically by machine and special interest.

If your association has something special on the agenda or if you're starting a new one, contact us at *Clubnet, Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

The listings are based on that of the Association of Computer Clubs.

Our Clubnet Report this week focuses on the South West London TRS80 User Group.

In touch with Tandy

The lively, three-year-old South West London TRS80 User Group, run by Ron Everitt, is an offshoot of the National TRS80 User Group. This local club meets twice a month at Stowford College, Sutton, where the principal, John Hennessy, is a member. He was joined by his son and 30-odd other members on the night *PCN* visited and a demonstration of new products was given by representatives of the Tandy City of London Computer Centre.

The Tandy Model 4, portable Model 100 and TRS80 DMP dot matrix printer were on show, and Peter Rankin, customer support manager for the centre, gave an enterprising and informative talk which elicited an interest in his products and a good many laughs as well.

Mr Rankin demonstrated how to drive fellow-commuters mad on trains by playing with one's portable model 100 on the way home. It comes in 8K and 24K versions, both upgradable to 32K. With built-in software, the cheaper version costs £499 and members were pleased to find that it interfaces to any Centronics or RS232 printer and has a cassette interface.

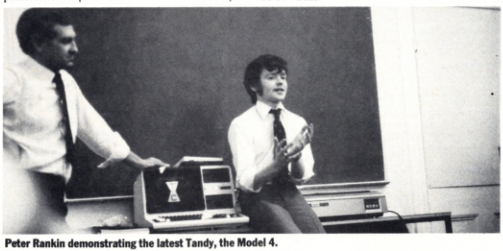
While two younger members played Caterpillar on the TRS80, Mr Hennessy said: 'The college itself has its own TRS80 which is used for computer studies courses.'

Meetings consist mainly of discussions and lectures and the group also concentrates on TRS80-compatible systems such as the Colour Genie and LNW80 micro.

Membership is £3 on entry and future plans include periodic weekend workshops run by the National TRS80 and Video Genie User Group. This publishes a monthly newsletter, and has several members who also belong to the Sutton group.

Wendie Pearson

Name SW London TRS80 User Group **Venue** Stowford College, 95 Brighton Road, Sutton, Surrey **Meetings** First Tuesday and third Thursday of each month **Contact** Ron Everitt, 01-394 2123.



Peter Rankin demonstrating the latest Tandy, the Model 4.

USER GROUPS

Acorn

Coventry Acorn Atom User Group. Peter Frost, 18 Frankwell Drive, Coventry, 0203 613156.

Kent Medway Acorn User Group. Meets at St John Fisher School on last Monday of month at 7pm. Sessions at 9pm Thursday at the Fox and Hound, Chatham. Clem Rutter, c/o St John's Fisher School, Ordance Street, Chatham, Kent, 0634 42811 (day), 0634 373459 (evenings).

Manchester Acorn User Group. Meets at AMC, Crescent Road, Crupsall, Manchester 8 on Tuesday except school holidays. John Ashurst, 192 Vendure Close, Failsworth, Manchester, 061-681 4962.

Apple

Ashtead Appler User Group. Meets first Monday of every month. Contact M Lawrence, 15 Petters Road, Ashtead, Surrey.

British Apple Systems User Group, PO Box 174, Watford WD2 6NF.

British Apple Systems User Group. Meets first Tuesday evening and third Sunday afternoon every month at Old School, Branch Road, Park Street, St Albans. Subs: £12.50+£2.50 joining. Contact D Bolton, 0727 72917.

Birmingham & Region Apple Group. Contact Mel Golder, 021-426 2275.

Bristol Apple Users and Dabblers. Meets at 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, once a month. Ewa Dabkowski, c/o Datalink, 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, 0272 213427.

Buckinghamshire Apple User Group. Steve Profitt, The Granary, Hill Farm Road, Marlow Bottom, Buckinghamshire, 062 84 73074.

Chelmsford Apple Users Club. Proposed new club. Contact D Beckingham, 571 Galleywood Road, Chelmsford, tel: Chelmsford 66948.

Croydon Apple User Group. Meets at Sidda House, 350 Lower Addiscombe Road, Croydon, on second Monday of month. Paul Vernon, 60 Flawkhurst Way, West Wickham, Kent, 01-777 5478.

London Apple Music Synthesis Group. Dr Davis Ellis, 22 Lennox Gardens, London SW1.

South-East London Apple User Group (Appletree). Contact John Grieve at 106 Maran Way, Erith, Kent or phone 01-311 7681.

Milton Keynes Microcomputer User Group. Meets every Tuesday, 7.30pm. Brian Pain, Sir Frank Markham School, Woughton Centre, Chaffron Way, Milton Keynes.

Atari

Birmingham User Group. Meets at the Malaga Grill, Matador Public House, Bull Ring shopping centre, Birmingham, on second and fourth Thursday every month at 7.30pm. Mike Aston, 42 Short Street, Wednesbury, West Midlands.

Carshalton Atari User Club. Paul Deegan, 01-642 5232.

Essex. Contact John Sarrar, 138 Frederick Road, Rainham, Essex, tel (76) 22077. Meets at Rainham Town Football Club, 7.30pm, second and fourth Friday of each month.

Hull Atari Users Local Group. Harvey Kong Til, 546 Holderness Road, Hull HU9 3ES. Hull 7911094.

London Silica Atari 400/800 User Club. Richard Hawes, 01-301 1111.

Manchester Atari Computer Enthusiasts. Meets at The Ellesmere, Worsley Road, Worsley, on the second and last Thursday of every month. Contact Martin Davies, Bolton 700757.

Norwich Atari User Group. Ken Ward, Norwich 661149.

Preston Atari Computer Enthusiasts. Meets at KSC Club, Merrion House, Beach Grove, Ashton, Preston, on third Thursday of month at 7.30pm. Roger Taylor, 0253 738192.

UK Atari Computer Owners Club. Contact PO Box 3, Raleigh, Essex.

Atom

Liverpool BBC and Atom User Group. Meets at Old Swan Technical College, Room C33 on first Wednesday of month at 7.30pm and at Birkenhead Technical College on third Thursday of month at 7.30pm. Nick Kelly, 051-525 2934 (evenings).

BBC

Laserbug is an international user group for the BBC micro. Paul Barbour, 10 Dawley Ride, Colnbrook, Slough, Berks, 02812 30614.

Beebug. Sheridan Williams or David Graham at PO Box 50, St Albans, Hertfordshire AL1 2AR.

Bournemouth BBC User Group. Meets at Lansdowne Computer Centre, 5 Holdenhurst Road, Bournemouth on first and fourth Wednesday of month at 7.30pm. Norman Carey, 0202 749612.

Brent/Barnet User Group. Meets on last Sunday of month. Joseph Fox, 4 Harman Close, London NW2 2EA.

Charlton & District (South Manchester) BBC Micro User Group. Contact Philip Harrison, 34 Holwood Drive, Manchester M16 8WS.

Chelmbug. Contact Ian on Chelmsford 69174.

Cardiff BBC Microcomputer Club. Meets alternate Wednesdays at Applied Science Lecture Theatre, University College, Newport Road, Cardiff.

Format 40/80 Club (BBC Disk User Group). Send SAE to Peter Hughes, Five Marsh Street, Bristol BS1 4AA.

Liverpool BBC & Atom Group. Meets on the first Wednesday of every month at Old Swan Technical College, Room C33, 7.30-9.30pm, and on the third Thursday at Birkenhead Tech. College, 7.30-9.30pm. Contact Nik Kelly, 56 Queens Drive, Walton, Liverpool L4 6SH.

North London BBC Micro Users Group. Meets at The Prince of Wales, 37 Fortune Green Road, on Tuesdays at 7pm. Dr Leo McLaughlin, Westfield College, University of London, Kidderpore Avenue, London NW3 7ST, 01-435 0109.

Norwich & District BBC Microcomputer User Group. Meets at Norwich City College on the first and third Tuesday of every month at 7pm. Subs: £3; students and OAPs £1.50. Contact Paul Beverley, Department of Electronics, Norwich City College, Ipswich Road, Norwich NR2 2LJ.

Preston area BBC Micro User Group. Meets at Boatmans Arms, Marsh Lane, Preston, on last Thursday of month. Duncan Coulter, 8 Briar Grove, Ingol, Preston, Lancashire, 0772 725793.

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Tyne & Wear BBC User Club. Contact Ian Waugh, 13 Briardene Drive, Wardley, Tyne & Wear NE10 8AN.
Wellingborough BBC Owners User Group. Contact R Houghton, 49 Addington Road, Irthlingborough.
Witham (NAMEBUG) BBC Micro User Group. Meets at comprehensive school, Witham on second Thursday each month at 7.30pm. Dave Watts 0245 358127 after 7pm.

Comal

London Comal User Group. Meets at Polytechnic of North London, Holloway, second Wednesday of month, term time. John Collins, 75 74111.

Commodore ICPUG

Basildon. Contact Walter Green, 151 The Hatherley, Basildon, Essex.
Bloxham. Contact John Temple, Kirabanda, Rose Bank, Bloxham, Oxon.
Barnsley. Bob Wool, 13 Ward Green, Barnsley, South Yorkshire, 0226 85084.
Blackpool. Meets at Arnold School, Blackpool, on third Thursday of month. David Jarrett, 197 Victoria Road, Thornton Cleveleys, Blackpool FY5 3ST.
Birmingham. Contact J A McKain, PPI Ltd, 177 Lozells Road, Birmingham, tel: 021-544 0202.
Bournemouth & Poole. Contact Douglas Shave, 97 Canford Cliffs Road, Poole, Dorset BH13 7EP.
Bury St Edmunds. Contact Alan Morris, 30 Kelso Road, Bury St Edmunds, Suffolk.
Burnley. Contact John Ingham, 72 Ardwick Street, Burnley, Lancashire.
Canterbury SE. Meets at The Physics Lab, Canterbury University, on first Tuesday and Wednesday of month. R Moseley, Rosemount, Romney Hill, Maidstone, 0622 37643.
Carrickfergus. David Bolton, 19 Carrickburn Road, Carrickfergus, Antrim BT38 7ND, 09603 63788.
Chelmsford. Contact A G Surridge, 97 Shelley Road, Chelmsford, Essex.
Cheltenham. Meets at the Cheltenham Ladies College on last Thursday of month at 7.30pm. Alison Schofield, 78 Hesters Way Road, Cheltenham, Gloucester, 0242 580789.
Clwyd. John Poole, 6 Ridgway Close, Connah's Quay, Clwyd CH5 4LZ.
Corby. Peter Ashby, 215 Wincohn Way, Corby, Northamptonshire, 05363 4442.
Coventry. Meets at Stoke Park School and County College at 7pm on fourth Wednesday of month except July, August, December. Will Light, 22 Ivybridge Road, Stryvechale, Coventry, Warwickshire.
Derby. Meets at Derby Professional Colour every other Tuesday at 7pm. Robert Watts, 03322 72869.
Derbyshire & District. Meets every other Monday 7-9pm at Davidson Richards Ltd, 14 Dufflied Road, Derby. Contact Raymond Davies, 105 Normanton Road, Derby DE1 2GG.
Devon. Contact Matthew Stibbe, The Lawn, Lower Woodfield Road, Torquay, Devon.
Durham. North-East Pet and ICPUG. Meets at Lawson School, Burnley at 7pm second and third Mondays. Jim Cocallis, 20 Worcester Road, Newton Hall Estate, Durham, 0385 67045.
Dyfed. Simon Kniveton, 097 086 303.
Gosport. Meets at Bury House, Bury Road, Gosport, Hants at 7pm. Contact Tony Cox, 10 Staplers Reach, Rowner, Gosport, Hants.
Hainault. Meets at Grange Remedial Centre, Woodman Path, Hainault. Carol Taylor, 101 Courtlands Avenue, Cranbrook, Ilford, Essex.
Glasgow. Dr Jim MacBrayne, 27 Daidmyre Crescent, Newton Mearns. Glasgow, 041-639 5696.
Gloucester and Bristol Area. Meets last Friday of each month. Contact Janet Rich, 20 Old Court, Spring Hill, Cam, Gloucester.
Hampshire. Meets at 70 Reading Road, Farnborough, on third Wednesday of month. Ron Geere, 109 York Road, Farnborough, Hants, 0252 542921.
Gosport. Contact Brian Cox, Bury House, Bury Road, Gosport, Hants, Fairham 280539.
Hants. Contact Tony Cooke, 7 Russell Way, Petersfield, Hampshire GU31 4LD.
Hertfordshire North. Meets at Provident Mutual Assurance, Purwell Lane, Hitchin, on last Wednesday of month. B Grainger, 73 Minehead Way, Stevenage, Herts SG1 2HS, 0438 727925.
Kilmarnock. Meets at Symington Primary School on first and third Thursday of month at 7pm. John Smith, 19 Brewlands Road, Symington, Kilmarnock KA1 5RW, 0563 830407.
Liverpool. Meets at The Merchant Taylor School for Boys, Crosby, on second Thursday of month at 7pm. Tony Bond, 27 Ince Road, Liverpool L23 4UE, 051-924 1505.
Llandyssul. Contact F Townsend, The Hill, Rhydowen, Llandyssul, 05455 5291.
London. Alan Birks, 135 Queen Alexandra Mansions, Judd Street, London WC1, 01-430 8025.
London North. Barry Miles, Department of Business Studies, North London Polytechnic, Holloway Road, London N7, 01-607 2789.
Maidstone. Meets on the first Wednesday of every month contact Ron Moseley, Lord Romney Hill, Weavering Maidstone, Kent, 0622 37643.
Manchester. Contact Clive Embrey, 17 Santon Avenue, Fallow Field, Manchester.
Mapperley. Meets at Arnold & Carlton College, Digby Avenue, Mapperley every Friday. Contact Mark Graves, 8 Digby Hall Drive, Gunthorpe Road, Gedling, Notts NG4 4JT.
Merseyside. Meets fortnightly. Contact P Leather, 27 St Luke's Drive, Formby, Merseyside, tel: 36 74694.
National. Contact Membership Secretary, 30 Brancoates Road, Newbury Park, Ilford, Essex 1G23 7EP.
Norfolk. Proposed new club. Contact J Blair, 7 Beach Road, Cromer, Norfolk.
Norfolk. Peter Petts, Bramley Hale, Wretton, King's Lynn, Norfolk PE33 9QS, 0366 500692.
Northampton. Contact Peter Ashby, 215 Lincoln Way, Corby, Northants.
Northern Ireland. Meets last Wednesday of each month. Contact David Weddell, 9 Upper Cavehill Road, Belfast BT15 5EZ, 0232-711580.
Northumberland. Graham Saunders, 22 Front Street, Guide Post, Northumberland.
Rhyl. Contact Frank Jones, 77 Millbank Road, Rhyl, Clywd, 0745 54820.
Slough. Meets at Slough College on second Thursday of month at 7.30pm. Brian Jones, 53 Beechwood Avenue, Woodley, Reading RG5 3DF, 0734 661494.
South-East. Regional Group. Meets at Charles Darwin School, Jail Lane, Biggin Hill, Kent, on third and fourth Thursday of month at 7.30pm. Jack Cohen, 30 Brancaster Road, Newbury Park, Ilford, Essex, 01-597 1229.
South Midlands. Meets at 12 York Street, Stourport-on-Severn on last Thursday of month. M J Merriman at above address.
Staffordshire. 57 Clough Hall Road, Kidsgrove, Stoke-on-Trent.
Stourport-on-Severn. Meets last Thursday of each month. Contact M Merriman, 12 York Street, Stourport.
Teddington. G Squibb, 108 Teddington Park Road, Teddington, Middlesex, 01-977 2346.
Watford. Meets on second Monday of month. Stephen Rabagtiati, c/o Institute of Grocery Dist. Grange Lane, Letchmore Heath, Watford, Herts, 01-779 7141.**Witney.** Contact Ian Blyth, 40 Wilmot Close, Witney 5171.
Wolverhampton. Meets monthly. Contact J Bowman, 6 The Oval, Albrighton, Wolverhampton, West Midlands.

Commodore Pet

Blackpool. West Lancashire Pet Users Club. Meets at Arnold School, Blackpool on the third Thursday of month. D Jowett, 197 Victoria Road, East Thornton, Blackpool FY5 3ST.
Southern Users of Pets Association. Howard Pilgrim, 42 Compton Road, Brighton BN1 5AN.
Pet User Group Crawley. Richard Oyer, 33 Parham Road, Ifield, Crawley.
Pet Users Education Group. Dr Chris Smith, Department of Physiology, Queen Elizabeth College, Camden Hill Road, London W8 7AH.
UK Pet Users Club. 360 Euston Road, London NW1 3BL.
Pet Users Group. Meets at Polytechnic of North London, Eden Grove, Room 320. On alternate Tuesdays, 6pm. Barry Miles 01-607 2789.
Pet User Club. Margaret Gulliford, 818 Leigh Road, Slough Industrial Estate, 0753 74111.
Independent Pet Users Group. 57 Clough Hall Road, Kielsgrove, Stoke-on-Trent, Staffordshire.

Commodore Vic

National Association of Vic-20 Owners. Contact S Tomananek, 20 Milner Road, Sherwood, Nottingham.
Burnley. John Ingham, 72 Ardwick Street, Burnley, Lancashire.
Clwyd. Contact A Stanners, 192A Willow Park, Queensferry, Deeside, Clwyd, Wales, 816603.
London. Vic Users Group. Meets on alternate Tuesdays at 6.30pm at Polytechnic of North London, Community Centre. Robin Bradbeer.
London. Contact Jim Chambers, Department of Psychology, University College London, Gower Street, London, WC1, 01-387 7050 x 413. Meets at University College, 26 Bedford Way, London WC1, third Tuesday of each month at 8pm.
Norfolk. J Blair, 7 Beach Road, Cromer, Norfolk, 0263 512849.

Compucolour

Caversham. Compucolour Users Group UK. Meets at Community Centre, Caversham Park Village twice a year. Peter Hiner, 11 Pennycroft, Harpenden, Hertfordshire, 05827 64872.

CP/M

Irish CP/M Users Group. Meets monthly in Dublin area. Doug Notley, Gardner House, Ballsbridge, Dublin 4, Dublin 686411.
London. CP/M User Group (UK). Subs £7.50. Produces newsletter. Contact David Powys-Lybbe, 01-247 0691.
UK CP/M Users Group. Lesley Spicer, 11 Sun Street, London EC2M 2QD, 01-247 0691.

COSMAC

COSMAC Users Group. James Cunningham, 7 Harrowden Court, Harrowden Road, Luton, Bedfordshire, 0582 423934.

Decus

Decus UK & Ireland. Contact Tracey Pardoe, DECUS, PO Box 53. Reading, Berks RG2 0TW.

Digital Equipment

Digital Equipment Users Society. The Secretary, PO Box 53, Reading, Berkshire, 0734 387725.

Dragon

Brixham Dragon Owners Club. Meets at Computer Systems (Torbay), Pump Street, Brixham, every Saturday at 2.30pm. Ian Chipperfield, 22 Brookdale Court, Brixham, Devon, Brixham 59224.

Epson HX20

London. Contact Terence Ronson, 25 Sawyers Lawn, Drayton Bridge Road, Ealing, W13, 01-998 1494.

Greater Manchester. Contact Melvin Franklin, 40 Cowlees, Westhoughton, Bolton, Lancs.
Luton. The Dragon's Den. Contact D Buckingham, 83 Neville Road, Limbury, Luton, Beds.

Education

Birmingham. Education ZX80/81 User Group. Eric Deeson, Highgate School, Balsall Heath Road, Highgate, Birmingham B12 9DS.
Birmingham. MUSE. National body for co-ordinating activity in schools, colleges. Lorraine Boyce, MUSE Information Office, Westhill College, Weoley Park Road, Birmingham, 021- 471 3723.
Dublin. Computer Education Society of Ireland. Dairmuid McCarthy, 7 St Kevins Park, Kilmacud, Blackrock, Co. Dublin.
Middlesex. Educational Users Group. Offshoot of National TRS-80 Users Group. Dave Fletcher, Head Teacher, Beaconsfield First and Middle School, Beaconsfield Road, Southall, Middlesex.
Worcestershire. Mini and Microcomputer Users in Education. National organisation. R Trigger, 48 Chadcote Way, Catshill, Bromsgrove, Worcestershire B61 0JT.

Forth

Forth Users Group. David Husband, 2 Gorleston Road, Branksome, Poole, Dorset BH12 1NW, 0202 764724.
Forth Interest Group UK. Meets at Room 408, South Bank Polytechnic on the first Thursday of month. K Goldie-Morrison, 15 St Albans Mansion, Kensington Court Place, London W8 5QH, 01-937 3231.

Forum

Forum 80 Users Group. Frederick Brown, 421 Endike Lane, Hull HU6 8AG.

FX-500P

FX-500-P Users Association. Max Francis, 38 Grymsdyke, Great Missenden, Buckinghamshire HP16 0LP.

Genealogists

Society of Genealogists Computer Interest Group. Anthony Camp, 01-373 7054.
Genie
Colour Genie User Group. Details of meetings/membership from Pat Doohan, secretary, Nottingham (0602) 278791.

Intel MDS

UK Intel MDS Users Group. Lewis Hard, c/o S.P.A.C.E., The Old Coach House, Court Row, Upton-on-Severn, Worcester WR8 0NS.

Ithaca Audio S100

Ithaca Audio S100 Users Group. Dave Weaver, 41 Dore Avenue, North Hykenham, Lincoln LN6 8LN.

Jupiter Ace

Jupiter Ace Users Group. John Noyce, Remsoft, 18 George Street, Brighton BN2 1RH.

Lynx

National Independent User-Group. Subs £9. Contact Robert Poat, 53 Kingswood Avenue, Sanderstead, South Croydon CR2 9DQ.

Mattel

Mattel Intellivision TV Game Group. Warrington 62215 after 4pm.

Medical

Durham. Primary Health Care Group. Dr Alastair Malcolm, British Computer Society, Cheveley Park Medical Centre, Belmont, Durham, 0385 64282.
London. Medical Micro Users Group. Medicom, 1-2 Hanover Street, London W1.
Middlesex. TRS-80 Medical and Laboratory Users. Dr Robinson, The Residency, Northwick Park Hospital, Harrow, Middlesex.

Micronet
Micronet Independent User Group. Contact George Foot, Prestel Mailbox No. 892852867.

Nascom
Berkshire. Nascom Thames Valley User Group. Meets at Frogmore Hotel, Windsor, on Thursday fortnightly, 8pm. Mike Rothery, 37 Eaton Wick Road, Eton Wick, Windsor, Berkshire. Windsor 56106.
Birmingham Nascom User Group. Meets at Davenports Social Club, Granville Street, Birmingham on the last Thursday of month, 8pm. Martin Sidebotham, 021-744 3093.
International Nascom Microcomputer Club. 80 Oakfield Corner, Sycamore Road, Amersham, Buckinghamshire HP6 5EQ.
Merseyside Nascom User Group. Meets at Mona Hotel, St James Street, Liverpool, on the first Wednesday of month, 7.30pm. Mr T Searle, 051-526 5256.

Newbrain
Wakefield Independent Newbrain User Group. Anthony Hodge, 15 St John's Court, Wakefield WF1 2RY.
Welwyn. Contact Angela Watkiss, 4 Ninnings Lane, Rabley Heath, Welwyn, Herts AL6 9TD.

Ohio
Ohio Scientific User Group. Tom Graves, 19a West End, Street, Somerset, 0458 45359.

Oric
Oric Owners Group. Paul Kaufman, 3 Club Mews, Ely, Cambridgeshire.
Kent. Contact Roger Pyatt, 23 Arundel Drive, Orpington, Kent with SAE or call 66 20281.

Osborne
British Osborne Owners Group. J Anglesea, Flat 19, Rowan House, Mitton Road, Handsworth, Birmingham B20 2JR.

OSI
OSI UK User Group. Richard Elen, 12 Bennerley Road, London SW11 6DS.

Pascal
Pascal User Group. Nick Hughes, PO Box 52, Pinner, Middlesex HA5 3FE.

PDP
Buckinghamshire. PDP8 User Group. Nigel Dunn, 21 Campion Road, Widmer End, High Wycombe, Buckinghamshire, 0494 714483.
Hertfordshire. PDP11 User Group. Pete Harris, 119 Carpenter Way, Potters Bar, Hertfordshire EN6 5QB, 0707 52091.

Pilot
UK Pilot User Group. Alec Wood, Wirral Grammar School for Boys, Cross Lane, Bebington, Wirral, Merseyside LG3 3AQ.

Prestel
ACC National Prestel Committee. Administrates Club Spot 800 (hobbyists on Prestel). Rupert Steele, St John's College, Oxford OX1 3JP.

Research Machines
Birmingham. Research Machines 380Z Peter Smith, Birmingham Educational Computing Centre, Camp Hill Teachers Centre, Stratford Road, Birmingham B11 1AR.
Leamington Spa. West Midland RML User Group. Spencer Instone, c/o 59 Avenue Road, Leamington Spa.
Newcastle. NERML 380Z User Group. Meets monthly at Micro-Electronics Education Centre of the Polytechnic Coach Lane Campus. Mr Hatfield or Mr Reed, Computer Unit, Northumberland Building, Newcastle Polytechnic, 0632 326002.
Oxford. Research Machines National User Group. RML, Mill Street, Osney, Oxford OX2 0BW. 0865 249866.
Oxford. Research Machines Ltd National User Group. M D Fisher, PO Box 75, Oxford OX4 1EY.

RML
West Midlands RML User Group. Contact 0926 38751.

Sharp MZ80
Aberdeen. International Sharp Users Group. Graham Knight, c/o Knights Computers, 108 Rossemount Place, Aberdeen, 0224 630526.
Essex. Sharp MZ80K User Group. Joe Street, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE.
Leeds. Sharp PC1211 Users Club. Jonathan Dakeyne, 281 Lidgett Lane, Leeds LS17 3AQ.
Somerset. Sharp MZ80 Users Club. Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset BA21 4AE.

Sinclair
Brighton. ZX Users Group. J Ireland-Hill Jnr, 145 Godwin Road, Hove, Brighton.
Aylesbury. Sinclair ZX Computer Club. Ken Knight, 0296 5181.
Colchester Sinclair User Group. Meets fortnightly. Richard Lawn, 102 Pettygate Road, Colchester, Essex.
Cardiff. ZX Club. Meets on last Sunday of month, 2pm. Mike Hayes, 54 Oakley Place, Grangetown, Cardiff, 0222 371732.
Doncaster & District Sinclair User Group meets at St Andrews Hall, Morley Road, Wheatley, Doncaster, every Wednesday except the first in each month. Contact John Woods, Doncaster 29357.
Edinburgh. ZX. Meets at Claremont Hotel, Claremont Crescent, Edinburgh, on second and fourth Wednesdays every month, 7.30pm. John Palmer, 56 Meadowfield Drive, Edinburgh, 031-661 3183.
Essex. Contact M Burnett, 24 Inverness Drive, Hainault, Ilford, Essex.
Glasgow. ZX80/81 User Group. Ian Watt, 10 Greenwood Road, Clarkston, Glasgow, 041-638 1241.
Liverpool. ZX Computer Club. Meets at ZX Computer Centre, 17 Sweeting Street, Liverpool, on Wednesday, 6.30pm. Keith Archer, 051-260 4950.
London. National ZX User Club. Tim Hartnell, Interface, 44-48 Earls Court, London W8.
London. Sinclair User Group. Meets at Polytechnic of North London, Room 2-5 Tower Block. Monday, 6.30pm. Irving Brand, Polytechnic of North London, Holloway Road, London.
Manchester Sinclair Computer Users Club. Proposed new club. Contact Colin Rushby, 061-881 6592.
ZX Spectrum Club. D Beattie, 63 Kingsley Crescent, Sawley, Long Eaton, Nottingham NG10 3DA.
Scunthorpe. Grange Farm ZX Computer Club, Scunthorpe, South Humberside. Meets first and third Tuesday of month. Contact Sheila & Fred Wilkinson, 0724 842970.
Staffordshire. ZX80 National Software Association. 15 Woodlands Road, Wombourne, Staffordshire WV5 0JZ.
Suffolk. ZX Amateur Radio User Group. Paul Newsman, 7 Red House Lane, Leiston, Suffolk, SAE essential. No telephone inquiries.
Surrey. Guildford ZX80/81 Users Group. Meets Fridays. A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, 0483 62035.
Surrey. ZX80/81 User Club. David Bigden, PO Box 159, Kingston-upon-Thames, Surrey KT2 5UQ.
West Sussex. Hassocks ZX Micro User Club. Paul King, 25 Fir Tree Way, Hassocks, West Sussex.

Sirius
Sirius User Group. Ray D'Arcy, Sirius User Club, The Microsystems Centre, Enterprise House, 7-71 Gordon Street, Luton, 0582 412215.

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68XX Special Interest Group, meets third Tuesday of each month. Contact Jim Anderson, 01-422 4724.

6809 User Group
6809 User Group. Produce bi-monthly newsletter. Contact Mr Gibbons, Clarence Lodge, Hurdon Road, Launceston, Cornwall PL15 9DB.

Software
London. Software Group. Meets at Polytechnic of North London, Room 2-3 Tower block Thursday, 6pm. Mike Duck at Polytechnic of North London, Holloway, London N7.
Oxford. Program of the Month Club. Mr Durrant, 55 St Thomas Street, Oxford OX1 1JG, 0865 250333.

Sorcerer
Liverpool European Sorcerer Club. Monthly meetings. Colin Marle, 32 Watchyard Avenue, Formby, near Liverpool L37 3JU, 07048 72137.
Surrey. Exidy Sorcerer User Group. Andy Marshall, 44 Arthurs Bridge Road, Woking, Surrey GU21 4NT.

Spreadsheet
International Electronic Spreadsheet Users Group. UK Alpha House, 7th Floor, Rowlandsway, Manchester M22 5RG.

Tandy
Tandy Model 100 User Group. SAE to Remsoft, 18 George Street, Brighton, tel: 0273 602354.

Tangerine
Avon. Tangerine Users Group. Bob Green, 1 Marlborough Drive, Worle, Avon, 0934 21315.
Bristol. Tangerine Homebrew. A Coales, 35 Mogg Street, St Werburghs, Bristol BS2 9UB.

Texas Instruments
Brighton. Contact Clive & Audrey Scally, 40 Barrhill, Patcham, Brighton, Sussex.
Ireland. Proposed new club. Contact Mrs Ann Flynn, 53 Georgian Close, North Road, Drogheda, Co. Louth, Eire.
Leeds. TI99/4A User Group. Meets at 30 Gipton Wood Road, Leeds 8, Mondays 7pm. I Youlden, 0532 401408.
Manchester. TI User Group. T Grimshaw, 2½ Allingham Street, Longsight, Manchester.
Manchester. TI9900 User Group. Chris Cadogan, Department of Computer Science, University of Manchester M13 9PL.

Triton
Triton User Group. Nigel Stride, Transam Ltd, 12 Chapel Street, London NW1, 01-402 8137.

TRS-80
Birmingham. National TRS-80 User Group. Meets at Adam & Eve Pub, 1st Floor, Bradford Street, Birmingham on last Friday of month. Michael Gibbons, 1 New Street, Castle Bromwich, Birmingham B38 9AP, 021-747 2260.
Chelmsford. TRS-80 User Group. Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.
Durham. North East TRS-80 User Group. Meets at Information Technology Centre, Gateshead on the third Wednesday of month, 7pm. J Dunn, 8 Ettrich Terrace, North Gateshead, County Durham.
Edinburgh. Scottish TRS-80 and Genie User Group. Meets at Mansion House Hotel, Milton Road, second Thursdays of month. Dick Mackie, 72 Morningside Drive, Edinburgh EH9 1DX, 031-447 6651.
Herts. Contact Reg Smith, 24 Sempill Road, Hemel Hempstead, Herts, 0442 60085.
Hull & District TRS-80/Beeb Users Group. Meets second Tuesday of month and Thursday 16 days later at Psychology Dpt, Hull University. Contact J Lawrence, 2a Hall Road, Hull HU6 8SA.
Isle of Wight. TRS-80 User Club. Meets at London Hotel, Ryde on last Friday of month, 7.30pm. Sean Coulson, 0903 614589.
Kent. TRS-80 User Group. Alan Reid, 22 Woodeys Road, Rainham, Kent, 0634 367012.
Greater Manchester. Northwest TRS-80 User Group. Meets at Barton Aero Club, Barton Aerodrome, Irlam, near Manchester on last Wednesday of month, 8pm. Melvin Franklin, 40 Cowlees, Westhoughton, Bolton, Lancs.
Lancs. TRS-80 Colour Computer Group. Subs: £3. Contact Ian Wild, 53 Darnton Road, Ashton-U-Lyne, Lancs OL6 6RL.
Liverpool. UK DOSPLUS User Group. Peter Toothill, 101 Swanside Road, Liverpool L14 7NL. 051-220 9733.
Liverpool. Merseyside TRS-80/Video Genie User Group. Meets second Thursday of month. 7.15pm. Peter Toothill, 101 Swanside Road, Liverpool L14 7NL. 051-220 9733.
London, SW. TRS-80 User Group. Ron Everitt on 01-394 2123.
Merseyside. TRS-80 User Group. N Rushton, 123 Roughwood Drive, Northwood, Kirby, Merseyside.
Milton Keynes. National TRS-80 and Genie User Group. Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes.
Nottingham. TRS-80 Genie Users Group. Meets at Wilford Moderns Rugby Club • House on first and third Wednesday every month at 7.30pm. Contact Geoffrey Hillier, 5a Gregory Street, Lenton, Nottingham NG7 2LR, Nottingham 783938.
London. TRS-80 Genie Group. Meets at Central Common Room, The Residency, Northwick Park Hospital on first Sunday of month. Dr Nick Robinson, Central Room, The Residency, Northwich Park Hospital.
Northants. TRS-80 User Group. Meets at Welwyn Park Community Centre on alternate Thursdays at 7pm. Neil Griffiths, 0858 65718.
Nottingham. East Midlands TRS-80 User Group. Mike Costello, 15 Langbank Avenue, Rise Park, Nottingham NG5 5BU, 0602 751753.
West Herts 80 User Group. Meets at St Stephen's Parish Centre, Station Road, Bricket Wood, St Albans, Herts. Tuesday evenings fortnightly. Contact Reg Smith, 24 Sempill Road, Hemel Hempstead.

Colour Genie
International Colour Genie Users Group. Write with SAE to The Secretary, NCGUG, 46 Highbury Avenue, Bulwell, Nottingham, 0602 278791.
National Colour Genie User Group. Marc Leduc, 46 Highbury Avenue, Nottinghamshire NG6 9DB.

UCSD
Hants. UCSD System Users Society. John Ash, Dicoll Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG2 0QB.
Oxford. UCSD Pascal UK Users Group. Malcolm Harper, Oxford University Computing Laboratory Programming Research Group, 45 Banbury Road, Oxford OX2 6PE.

CUA
CUA User Group. Adrian Waters, 9 Moss Lane, Romford, Essex.

6502
Bedfordshire. 6502 User Group. Walter Wallenborn, 21 Argyll Avenue, Luton, Bedfordshire LU3 1EG, 0582 26927.
Hants. 6502 User Group (Southern Region). Steve Cole, 70 Sydney Road, Gosport, Hants.

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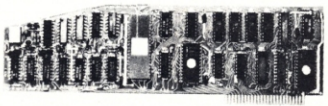

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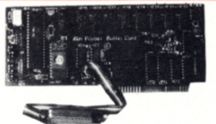

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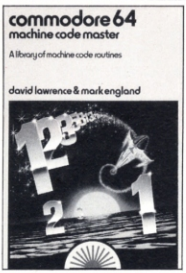
A mixed bag of Apple books this week, but first a tasty slice of Commodore programming.



'Commodore 64 Machine Code Master' by David Lawrence and Mark England, published by Sunshine Books at £6.95 (paperback, 191 pages).

At last, a truly useful book for the machine code programmer — and it's easy to read as well. David Lawrence and Mark England are to be congratulated for coming up with an original idea in a field currently lost in the depths of mediocre games listings and rewrites of manufacturers' manuals.

For the low price of £6.95 the book gives you complete listings for a machine code monitor, disassembler, file editor and assembler — all written in easy-to-understand Basic and fully documented.

But these are just the tools you begin with. After this you move on to greater things such as extending the Basic of your Commodore 64 — lord knows, it needs it.

What the book won't do is teach you machine code programming, a point the authors make clear in their introduction. If you are not an experienced machine coder, however, there's no need to worry. You can follow everything in the book without ever having looked at an opcode. Of course, you'll get more from it if you learn as you go.

The assembler here is a real two-pass version with full labelling and error checking.

If you feel daunted by the prospect of entering this much complex code, don't be. The authors expect you to make mistakes and have provided for that in the layout of the book. You actually enter the various programs in a series of carefully designed modules. Each module is fully documented and a checksum program is provided which should make it extremely difficult for a mistake to slip passed unnoticed.

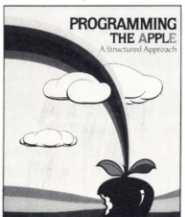
Once you have the machine code tools in and debugged the fun easily starts. You can add a dozen new commands and statements to Basic, plus three functions.

These are presented in the same styles as the first part of the book — with modules, documentation and checksums. Among the new commands are UNDEAD, a version of UNNEW written after a Dracula movie, PLOT, routines to save, load and verify machine code, and an improved RESTORE that allows you set DATA pointers to a line of the Basic program.

Programmers will be interested in DEEK and DOKE, which let you PEEK and POKE two consecutive memory locations, *ie* 16-bit manipulation.

Having followed the notes of the authors, you should, on completion of the book, be in a position to add your own new commands to Basic.

Messrs Lawrence and England are to be commended. It is impossible to overpraise *Machine Code Master*. **PW**



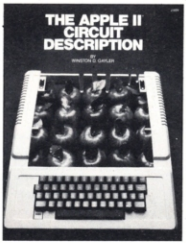
'Programming the Apple — a Structured Approach' by J L Campbell and Lance Zimmerman, published by Prentice-Hall at £16.95

When I first picked up this book I though my prayers had been answered — structured programming for the Apple. Unfortunately, this is not the case, but don't let that put you off. This is a well-written, clear tutorial with a plethora of program examples to highlight each point.

Not only does the book cover all the aspects of programming but it also gives lucid explanations of how the Apple goes about its job, interfacing to peripherals and so on. Although I have been using Apple computers for a long time and class myself as proficient, I was amazed at how much I seem to have missed.

There's a quote from James Thurber at the start of chapter ten that sums it up: 'So much has already been written about everything that you can't find out anything about it'. That was how I felt until I discovered . . . this book!

I must admit to being very critical of books on programming, but this one wins my full praise. It is far and away the best of its genre that I have had the opportunity to read and use. Whether you're a novice or an expert this book is a must. The two authors really have got it right, even down to producing the entire book using Applewriter on an Apple. **NC**



'The Apple II Circuit Description' by Winston D Gayler, published by Prentice-Hall at £19.50 (ring-bound paperback, 172 pages plus 44 schematics).

For all its strange-looking cover, this book is excellent. Depending on your knowledge of electronics, it can either be an insight to the Apple or a full-blown technical manual.

Winston Gayler's intended audience, he says in the preface, includes engineers, technicians, students of electronics and hobbyists. Despite my own background in electronics I found it heavy going, but still came away from it feeling glad that I'd read it.

The author has managed to squeeze in a detailed circuit description of the Apple including the mother board in all its guises, from the first (Revision 0) through to the latest (RFI Revision D). The two Apple keyboards are also covered.

Most of the Apple's circuitry is geared to the production of a video signal, so the author has seen fit to include as an appendix an introduction to video techniques. I found this section the most interesting part and learned so much about video signals that I would recommend the book on the strength of it.

For organisations producing interfacing cards for the Apple or for individuals interfacing to non-standard devices this book is essential. It contains the schematics for every board that Apple has put inside the box.

Circuit Description is a godsend for the technically oriented, and if you feel inclined to design your own computer, then seeing how this one is put together is no bad starting point. **NC**

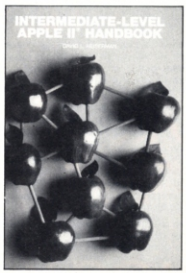
'Intermediate-Level Apple II Handbook' David L Heiserman, published by Prentice-Hall at £14.40 (ring-bound paperback, 324 pages).

David Heiserman claims in the preface to his book that 'If you have already mastered the fundamentals of Basic programming and want to do more — a lot more — with your Apple, this is the book for you'.

The book did not live up to its claim. In fact it almost caused me to unlearn all the techniques that I have managed to fabricate for myself over the years.

However, for the first-time user of an Apple, it offers an insight into better programming techniques and introduces a sensible approach to machine-code. My major grouse is that that whole concept is based around Integer Basic, which is restrictive due to its lack of floating-point arithmetic and small language set.

The book's approach is methodical to the point of boredom, but at least it explains each new point of interest with clarity. **NC**



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DATABASICS

This week PCN Databasics lists a selection of add-ons for your micro. PCN keeps you up to date in three-week cycles, listing peripherals, then software, followed by micros.

Printers are best categorised by print-head type. The two most common methods of transferring type to paper are the **Dot matrix** and **Daisywheel** techniques.

A dot matrix printer uses a row of pins which are programmed to strike the paper through a ribbon and form the character as a pattern of dots.

The daisywheel acts more like a conventional typewriter, the character set being pre-formed on a wheel with each character on a separate spoke. As the interchangeable wheel rotates it is struck by a hammer to form the character impression.

Dot matrix printers tend to be faster than daisywheel but offer lower print quality.

In selecting a printer make sure the **interface** on your computer is compatible with those available as standard or at extra cost on the printer.

The ● sign means the interface is included in the price; O means you have a choice of interfaces included in the price; + means the interface will cost extra.

Max Baud rate indicates the approximate characters-per-second rate as they are fed into the printer.

The **buffer** stores characters sent by the computer. The printer can take characters in chunks, at a rate quicker than they are able to be printed, sometimes allowing the computer to be freed for further use.

Lines per inch indicates the maximum number of lines printed in a vertical inch. **Characters per inch** can be varied on some printers as the typesizes themselves can be adjusted.

Maximum print speed as indicated by the manufacturer tends to be a little optimistic. **Maximum print positions** tells you the optimum number of characters that can be printed in one line by the smallest character size on the printer. **Maximum paper width** is the widest paper the printer can take.

Size represents the space the printer takes up on a desk top. **The weight** of the printer is given in kilogrammes.

Maximum copies indicates the number of carbon copies that can realistically be produced at one time.

Underlining puts a line under characters while **bold type** thickens the characters to make them stand out. **True descenders** indicates that the print method allows for fully formed tails on letters such as p,g or q.

Proportional spacing puts the same space between characters whether they are a long 'm' or a short 'i'. **Block graphics** builds up pictures using rectangular blocks, while **High Resolution Graphics** uses smaller dots.

Bidirectional means the printer can save time by printing left to right and then doing the next line backwards right to left. Similarly, **Logic Seeking** enables the machine to save more time by printing the short lines without sweeping over the whole width of the page.

Feed methods comprise **fanfold** which uses continuous stationery sheets folded road-map style drawn into the printer by a tractor mechanism. The tractor cog fits into holes in the fanfold paper and takes the paper past the printer mechanism. **Roll** is a roll of paper that feeds into the printer, usually using **friction feed** where the paper is gripped between two rollers, typewriter-style. **Cut sheet** indicates the printer uses single sheets like a typewriter.

Distributor: to find which company distributes a particular add-on, use the code listed in this column to refer to the distributor table.

The table is at the end of the listings, and gives the distributor's name and telephone number.

PERIPHERALS

PRINTERS

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+)					Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method				Distributor
			I.EEE	Centronics	20ma	RS232	Others ●	Others (+)																			Fan Fold	Roll	Cut Sheet	Tractor	Frictional	
Adler TRD 170	£833	Daisywheel		●		●			9600	256	6,8	10,12,15	17	198	15.5	56×37	13	6	●	●	●	●			●	●	●	●	●	●	●	T2
Anadex DP 9000A	£1,397	M 7×9, 9×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	106	9.5	40.9×57	13.6	6	●	●	●				●	●	●	●			●		I1
Anadex DP 9001A	£1,397	M 7×9, 11×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	132	9.5	40.9×57	13.6	6	●	●	●				●	●	●	●			●		I1
Anadex DP 9500	£1,397	M 9×9		●	●	●			9600	700	6,8	10,12,13.3	200	176	15.5	39×59.9	16	6	●	●	●				●	●	●	●			●		I1
Anadex DP 9500A	£1,397	M 7×9, 9×9, 13×9		●	●	●			9600	2700	6,8	10,12,13.3	200	176	15.5	40.9×70.3	16	6	●	●	●				●	●	●	●			●		I1
Anadex DP 9500L	£1,295	M 7×9, 9×9		●	●	●			9600	700	6,8	10	150	132	15.5	39×59.9	16	6			●				●	●	●	●			●		I1
Anadex DP 9501	£1,397	M 7×9, 11×9		●	●	●			9600	700	6,8	10,12.5,15,16.7	200	220	15.5	39×59.9	16	6	●	●	●				●	●	●	●			●		I1
Anadex DP 9501A	£1,397	M 7×9, 11×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	220	15.5	40.9×70.3	16	6	●	●	●				●	●	●	●			●		I1
Anadex DP 9620A	£1,489	M 7×9, 9×9, 13×9		●		●			9600	1500	6,8	10,12,15,16.4	200	216	15.5	40.9×70.3	16	6	●	●	●				●	●	●	●			●		I1
Anadex WP 6000	£2,616	M up to 18×20		●		●			19200	4500	6,8,12,16	10,12,16.7	285	220	15.5	46.7×74.9	25	6	●	●	●	●			●	●	●	●		●	●	●	I1
ASP 3500	£977	M 9×7, 9×9		○		○			9600	80	6,8	10,12,16.5	180	217	14	61.5×40.5	19	6	●	●	●		●	●	●	●	●						M1
Brother HRI	£747	Daisywheel		○		○	○		9600	2000	4,5,6	10,12,15	35	198	16.5	38.1×71.2	16	8			●				●	●			●			●	J1
Canon AP400	£1,140	Daisywheel	●			●		1	19200	4000	4,6,8	10,12,15	25	197	15.5	50.8×48.2	18.5	6	●	●	●	●	●		●	●	●	●	●	●	●	●	D1
Centronics 159/4	£962	M 9×7				●			9600	768	6	5,8.18,10,16.36	150	80	10	38×35.6	10	5							●	●	●				●	●	B1
Centronics 150/4	£682	M 9×7				●		1	9600	768	6,8	10,12,16.36	150	132	9.5	38.1×35.5	9.1	3	●		●	●				●	●	●			●	●	R1
Centronics 152/4	£788	M 9×7				●		1	9600	708	6,8	10,12,16.5	150	217	9.5	38.1×35.5	9.1	3	●		●	●			●	●	●	●			●	●	R1

Centronics 154	£869	M 11×8		●		●			9600	2000	6,9,12,18	5,10,16.5	120	132	15	52.6×37.1	13	5	●		●			●	●	●	●			●		C1
Centronics 159/2	£881	M 9×7		●					N/A	768	6	5,8.18,10,16.36	150	132	10	38.1×35.6	10	5							●	●	●		●	●	●	B1
Centronics 351	£1,891	M 7×9		●	+	●			19200	2000	6,8	5,6,8.25,10,12,16.5	200	192	15	45.7×55.9	18	6	●	●	●		●		●	●	●	●	●	●	●	B1
Centronics 352	£1,966	M 7×8		●	+	●			19200	2000	6,8	5,6,7.5,8.25,13.2,15,16.5	200	218	14.5	55.9×45.7	18.1	6	●					●	●	●	●		●	●	●	C1
Centronics 353	£2,420	M 7×8			+	●			19200	4000	3,4,6,8,12	10,12,13.2,15,16.5	200	218	15	55.9×45.7	18.1	6	●		●			●	●	●	●		●	●	●	C1
Centronics 739/2	£710	M 11×9		●					2200	132	6	5,8.3,10,16.7	100	132	9	36.8×27.9	5.4	5	●			●		●			●	●	●		●	C1
Centronics 739/4	£786	M 11×9				●			9600	512	6	5,8.3,10,16.7	100	132	9	36.8×40.6	7.2	5	●			●		●			●	●	●		●	C1
Commodore 4022P	£454	M 6×7	●						N/A	N/A	2	5,10	40	80	10	36.8×33	9.9	3					●	●	●	●	●	●		●		C2
Commodore 8023	£1,029	M 5×8	●						N/A	N/A	2	5,10	150	250	15	51.4×36.8	11.6	3		●			●	●	●	●	●	●	●	●		C2
Data Products DP55	£1,687	Daisywheel				●		2	9600	1000	6,8	10,12,15	55	198	15	44.4×60.4	24	6	●	●	●	●		●	●	●	●	●	●		●	S1
Data Products M100	£1,790	M 9×9		+		+	1		N/A	N/A	6,8	5,8,10,16.5	140	218	16	67.5×59.4	27	6	●	●	●	●	●	●	●	●	●			●		S1
Data Products M120	£1,741	M 7×7		+		+	1		N/A	N/A	6,8	5,10,16.7	180	220	16	67.5×59.4	27	6							●	●	●			●		S1
Data Products M200	£1,979	M 7×7		+		+	1		N/A	N/A	6,8	5,10.8,16.7	340	340	16	67.5×59.4	27	6							●	●	●			●		S1
Data South DS180	£1,604	M 9×7	+	●	+	●		1	9600	2000	6,8	5,6,8.25,10,12,16.5	180	217	15.5	60.9×40.6	16	6	●	●	●		●	●	●	●	●			●		D2
Diablo SP1/P11	£2,127	Daisywheel				●			9600	256	6,8	10,15	40	198	16	56.9×46.3	27.2	6	●	●	●	●			●	●			●		●	M2
Diablo 630	£2,127	Daisywheel				●			9600	768	6,8,12	10,12,15	40	198	16.5	56.9×46.3	27	6	●	●	●	●			●	●	●			●	●	M2
DMP 100	£249	M 5×7		●		●			1200	2000	6,8	10.5	50	80	9.5	40.6×20.9	3.9	1	●	●	●		●	●		●	●			●	●	T1
DMP 200	£499	M 9×23		●		●			1200	2000	6,8	10	120	120	9.5	41.9×34.3	7.5	3	●	●	●	●	●	●	●	●	●	●		●	●	T1
DMP 400	£699	M 7×9, 9×9		●		●			1200	2000	6,8	10,12,16.7	140	220	15	61.9×40.4	19	5	●	●	●	●	●	●	●	●	●		●	●		T1
DMP 500	£1,099	M 23×9		●					9600	2000	6,8	10,12,16.7	220	220	15	58.4×33	12.7	5	●	●	●	●	●	●	●	●	●		●	●		T1
DMP 2100	£1,399	M		●		●			1200	2000	6,8,12	10,12,16.6	160	232	15	55.2×38.1	20	8	●	●	●	●	●	●	●	●	●			●		T1
DRE 8820	£895	M 9×7		○		○			9600	500	6,8	10,12.5,15,16.7	150	266	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8830	£1,300	M 9×7		○		○			9600	500	6,8	10,12,13.3,15,17	180	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8840	£1,370	M 9×7		○		○			9600	500	6,8	10,12,13.3,15,17	240	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8910	£1,585	M 9×7, 9×11		○		○			9600	500	6,8	10,12,13.3,15,17	160	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8925	£1,660	M 12×8, 12×20		○		○			9600	500	6,8	10,12,15,16.7	120	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRH 80	£621	M 7×9		○		○			9600	256	6,8	10,12.5,15,17.5	80	140	8	41.5×30	7.5	4	●	●	●		●		●	●	●	●	●	●	●	T1
DRH 136	£776	M 7×9		○		○			9600	2000	6,8	10,12,15,16.5	120	224	15.5	48.6×30.3	10.5	3	●	●	●		●	●	●	●	●	●		●	●	T1
DRS 250	£1,431	M 7×9		○		○			19200	512	6,8	10,12,15	250	198	6	61×45	25	5	●	●	●		●	●	●	●	●			●		T1
DWP 410	£995	Daisywheel		●					9600	2000	6,8	10,12	25	160	16	60.3×19.6	16	5	●	●	●	●			●	●	●		●	●	●	T1
Epson MX80	£401	M 9×9		●	+	+		1	19200	256	6,8	5,8.25,10,16.5	80	132	10	40.6×38.1	5.5	3	●	●	●		●	●	●	●	●			●		E1
Epson MX80 FTT/3	£447	M 9×9		●	+	+		1	19200	256	6,8	5,8.25,10,16.5	80	132	10	40.6×38.1	7.7	3	●	●	●		●	●	●	●	●			●		E1
Epson MX82	£470	M 9×9		●	+	+		1	19200	256	8	17.2	80	159	10	40.6×38.1	7.7	3	●	●	●	●	●	●	●	●	●	●	●	●	●	E1
Epson MX100FT/3	£574	M		●	+	+		1	19200	256	8	16.5	100	233	15.5	59.7×40	10	3	●	●	●		●	●	●	●	●	●	●	●	●	E1
Facit 4510	£672	M 9×7		○	○	○			9600	712	6,8	6,12,16,17.5	100	132	11.5	42.5×34.8	9	5	●	●	●	●		●	●	●	●	●		●	●	A2
Facit 4525	£1,150	M 9×9		○	○	○			9600	512	6,8	5,8.5,10,17	280	132	11.5	46.5×35.6	13.5	5	●	●	●				●	●	●			●		A2
Facit 4542	£2,300	M 9×14		●	+	+			9600	800	6,8	10,12,15	250	232	18	64×45.7	40	5	●	●	●	●	●	●	●	●	●			●		A2
Fujitsu 830	£2,179	Daisywheel		+	●	●			1200	256	3,6,8	10,12,15	80	204	15	59.7×44.9	18	6	●	●	●	●		●	●	●	●		●	●	●	Z1
General Electric 2030	£961	M 9×7				+	1		1200	640	2,4,6,8,12	10,13,16.5	60	218	15.5	54.6×47.6	9.9	2	●						●	●	●	●		●	●	Z1
General Electric 2120	£1,751	M 9×7				+	1		1200	640	2,4,6,8,12	10,13,16.5	150	218	15.5	54.6×47.6	9.9	2	●						●	●	●	●		●	●	Z1
General Printer GP300	£2,287	M 9×9, 18×25				●		2	19200	380	6,8	10,12,15	300	120	13.5	52×44.5	20	5	●	●	●	●	●	●	●	●	●		●		●	I2
General Printer GP300L	£2,490	M 9×9, 18×25				●		2	19200	380	6,8	10,12,15	300	132	13.5	63.5×51.5	24	5	●	●	●	●	●	●	●	●	●		●		●	I2
Hermes 612C	£2,242	M 36×18		●	+	●			9600	2000	6,8	10,12,15	200	198	15	426×620×180	22	6	●	●	●	●		●	●	●	●		●	●	●	M7
Integrex	£914	M 7×5, 9×6	+	●		+			N/A	37	6,8	10	125	80	10	38.7×32.5	9.6	1					●	●			●			●		D3
ITT Swift 3342	£1,719	M 9×7			○	○			1200	640	2,3,4,6,8,12	10,13,16.5	150	240	15.5	56×47	10.4	6	●		●				●	●	●	●		●	●	I3
ITT Swallow	£914	M 9×7		○	○	○			1200	640	2,4,6,8,12	10,13,16.5	60	240	15.5	56×47	10	6	●		●				●	●	●	●			●	I3
Juki 6100	£459	Daisywheel	+	●	+	+			2400	2000	6,8	10,12,15	18	165	13	454×520×151	14	4	●	●	●	●		●	●	●	0		●	0	●	M7
Lear Siegler	£1,667	M 9×9		○	○	○			19200	2000	6,8	10,12	180	218	16	68.6×50.2	22.7	5	●		●	●	●		●	●	●			●		I4
Logabax LX213	£1,840	M 9×9		+		●			9600	4000	6,8	10,12,16.5	180	218	15	57.1×43.2	17	5	●	●	●				●	●	●			●		T3
Logabax LX217	£2,242	M 9×9		+		●			9600	400	6,8	10,12,16.5	180	218	15	57.1×43.2	17	5	●	●	●				●	●	●		●	●		T3
Micro Peripherals 99G	£517	M 9×7, 11×9		●		●			9600	2048	6,8	10,12,16.5	100	136	9.5	41.1×27.3	6.7	2	●	●	●			●	●	●	●	●	●	●	●	T3
Micro Peripherals 150G	£918	M 9×7, 11×9		●		●			9600	8192	6,8	10,12,16.5	150	226	15	58.4×39.9	11.2	2	●	●	●		●	●	●	●	●			●		T3
MT120 I	£600	M 9×7	+	●	+	+			9600	132	6,8	10,12.5,16.6,20	160	132	10	34.3×24.1	7.5	4		●	●		●	●	●	●	●	●	●	●	●	M3
MT120 L	£765	M 9×7	+	●	+	+			9600	132	6,8	10,12.5,16.6,20	160	132	10	34.3×24.1	7.5	4		●	●		●	●	●	●	●	●	●	●	●	M3
MT1802 I	£1,845	M 7×9	+	○	+	○			9600	218	6,8	10,16.6	200	218	16	55.9×76.2	8.6	5			●				●	●	●			●		M3
MT1802 L	£2,205	M 7×9	+	○	+	○			9600	218	6,8	10,16.6	200	218	16	55.9×76.2	8.6	5			●				●	●	●			●		M3

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+)						Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method					Distributor
			I.EEE	Centronics	20ma	RS232	Others ●	Others (+)																			Fan Fold	Roll	Cut Sheet	Tractor	Frictional	
PRINTERS																																
MT440 I	£1,966	M 9×7		●		+	+		9600	220	3,4,6,8,12	10,12.5,16.6	400	220	16	66×45.7	36	5			●				●	●	●			●		M3
MT440 L	£2,185	M 9×7		●		+	+		9600	220	3,4,6,8,12	10,12.5,16.6,	400	220	16	66×45.7	36	5			●				●	●	●			●		M3
MT420 I	£882	M 9×7		●		+	+		9600	220	3,4,6,8,12	10,12.5,16.7	200	220	16	66×45.7	36	5		●	●	●			●	●	●			●		M3
MT420 L	£954	M 9×7		●		+	+		9600	220	3,4,6,8,12	10,12.5,16.7	200	220	16	66×45.7	36	5		●	●	●			●	●	●			●		M3
MT140 I	£1,593	M 9×7	+	●		+	+		9600	218	6,8	10,12.5,16.6,20	160	218	16	48.3×24.1	7.5	4		●	●		●	●	●	●	●		●	●	●	●	M3
MT140 L	£1,869	M 9×7	+	●		+	+		9600	218	6,8	10,12.5,16.6,20	160	218	16	48.3×24.1	7.5	4		●	●		●	●	●	●	●		●	●	●	●	M3
Newbury Labs 1550	£747	M 9×7		○			○		9600	2000	6,8	5,6,8.5,10,12,17	120	230	15.5	55.9×30.5	11	3	●	●	●	●	●	●	●	●	●		●	●	●	N1
Newbury Labs 8510A	£552	M 9×7		○			○		9600	3000	6,8	5,6,8.5,10,12,17	120	132	10	55.9×28.6	8.5	3	●	●	●	●	●	●	●	●	●		●	●	●	N1
Newbury Labs NL40	£1,478	Daisywheel		○	○	○			2400	2000	6,8	10,12	40	163	15.5	55.9×43.2	14	2	●	●	●	●	●		●	●	●		●	●	●	N1
OKI Microline 80	£242	M 5×7		●			+		9600	256	6,8	5,10,16.5	80	132	9.5	34.2×24.5	6.5	4					●			●	●			●	●	X1
OKI Microline 82A	£378	M 9×7		●	●		+		1200	132	6,8	5,8.3,10,16.5	120	132	9.5	36.1×32.8	8.9	4	●			●		●	●	●	●			●	●	X1
OKI Microline 83A	£608	M 9×7		●	●		+		1200	132	6,8	5,8.3,10,16.5	120	132	15	51×32.8	14	3	●			●		●	●	●	●			●	●	X1
OKI Microline 84	£948.75	M		○	○	●			4800	132	6,8	5,8.3,10,12,17	200	231	15	51×32.8	14	3	●	●	●	●		●	●	●	●		●	●	●	X1
Olivetti DM5050	£575	M 7×9		●		+	+	4	9600	1000	6	10,12.5,16.5	100	132	9	11.6×30	7.5	2	●	●	●			●		●	●			●	●	B2
Olivetti DM5100	£1,033	M 7×9	○	○	○	○			9600	256	6	10,12,16.5	140	220	14.75	59.2×40.1	17	4	●	●	●		●		●	●	●			●		B2
Olivetti DM5200	£1,351	M 7×9	●	+	+	+			9600	256	6	10,12,16.5	200	220	19.75	59.2×40.1	17	4	●	●	●		●		●	●	●			●		B2
Olivetti DY-211	£862	Daisywheel	+	●		+	●		9600	1000	6	10,12,15	29	198	17	54.1×32.8	16.3	4	●	●	●	●			●	●	●	●	●	●	B2
Olivetti DY-311	£1,322	Daisywheel	+	○			○		9600	1000	6	10,12,15	39	225	17.25	60×50	17	4	●	●	●	●	●		●	●	●	●		●	●	B2
Olivetti JP101	£420	Dry Ink Jet		●		+	+		9600	1000	6,8	10,12,18	50	147	9	39×26.8	5.2	1	●				●	●	●	●	●			●		B2
Olivetti TH240	£661	Thermal 5×7				+	●		9600	1000	6	10	240	80	8.75	40.1×34	7.5	1	●	●				●		●	●			●		B2
Olympia ESW102RO	£1,917	Daisywheel	+	+		+	●		19200	4000	6	10,12,15	24	141	17	52.8×37	13	6	●	●	●	●			●	●	●		●	●	●	I5
Olympia ESW103KSR	£1,263	Daisywheel	+	+		+	●		19200	4000	6	10,12,15	24	212	17	52.8×43.1	14.5	6	●	●	●	●			●	●	●		●	●	●	I5
Olympia ESW3000RO	£1,306	Daisywheel	○	○			○		19200	4000	3,4,6	10,12,15	50	225	17	60.4×40.8	19.5	6	●	●	●	●			●	●	●		●	●	●	I5
Phillips Mullard GP300	£2,287	M			+		●		19200	512	3,4,6,8,12	10,12,15	300	180	14.4	64.5×52.3	24	6	●	●	●	●	●		●	●	●		●	●	●	R2
Printex 920	£2,012	M			+		●		9600	1792	6,8,12,16	10,12,13.3,16.7	340	227	16	59×42.5	20	4	●	●	●		●	●	●	●				●		T3
Qume Sprint 9/35	£1,892	Daisywheel					+	1	9600	500	6,8	10,12,15	35	198	15	61.3×49.9	19	3	●	●	●	●	●		●	●	●			●		Q1
Qume Sprint 9/45	£1,966	Daisywheel					+	1	9600	500	3,6,8	10,12,15	45	198	15	61.7×42.5	20.4	3	●	●	●	●	●	●	●	●	●			●		Q1
Qume Sprint 9/55	£2,403	Daisywheel					+	1	9600	500	3,6,8	10,12,15	55	198	15	61.7×42.5	20.4	3	●	●	●	●	●	●	●	●	●			●		Q1
Rair Decwriter III	£2,261	M 7×7				+	●		9600	1000	2,3,4,6,8,12	5,6,6.6,8.25,10,13.2,16.5	180	132	15	69.9×60.9	46.4	3	●						●	●	●		●			R1
Rair Decwriter IV AA	£1,200	M 7×9				+	●		300	256	2,3,4,6,8,12	5,6,6.6,8.25,10,13.2,16.5	30	127	15	57.1×39.4	11.3	3					●			●	●					R1
Rair 630	£1,940	Daisywheel				+	●		9600	768	6,8	10,16.5	40	196	15	59.9×46.4	27.2	2	●			●	●		●	●	●	●	●	●	●	R1
Rair 820	£1,529	M 9×7				+	●		9600	1280	6,8	10,16.5	150	132	15	66×53.4	18.2	6	●			●			●	●	●	●	●	●	●	R1
Rair Centronics 150/4	£722	M 9×7		+			●		9600	N/A	6	10	150	132	10	38.1×35.6	9	2					●		●	●	●	●	●	●	●	R1
Rair/Texas Instruments 743	£1,437	Thermal					●		300	N/A	6	10	30	80	8.5	39.1×40.6	6.1	1	●										●		●	R1
Ricoh RP1300 Flowriter	£1,144	Daisywheel	○	○			○		9600	200	8	10,12,15	37	163	15	59.3×33.2	14	7	●	●	●	●	●	●	●	●	●	●	●	●	●	A1
Ricoh RP1600 Flowriter	£1,782	Daisywheel	○	○			○		9600	2000	8	10,12,15	60	163	15	62.5×35.5	22	7	●	●	●	●	●	●	●	●	●	●	●	●	●	A1
Ricoh RP1600S	£1,667	Daisywheel	+	+			●		9600	4000	6,8	10,12,15	65	204	13.5	63.5×36.2	27	7	●	●	●	●	●	●	●	●	●	●	●	●	●	M4
Sanders S700	£2,875	M		●			●		9600	2000	6,8	6,10,12,15,17,18	450	234	14.5	47×56.9	23.6	5	●	●	●	●	●	●	●	●			●		●	A2
Seikosha GP100A	£247	M 5×7	+	●	+	+			9600	256	6	6,12	50	80	10	42.7×23.8	4.5	3			●				●				●		●	D4
Shinwa-CTI CP80	£333.50	M 9×13		●			+		9600	132	6	11	80	142	10	295×377×125	5.3	4	●	●	●		●	●	●	●			●	●	●	M7
Smith Corona TP1	£557	Daisywheel		○			○		19200	N/A	3,4.5,6	10,12	120	126	13	49.5×31.5	8.4	5	●	●	●								●	●	●	●	D1
Sord SLP160	£724	M		●					9600	136	6,8,9	10,12	120	136	15	51×36	13	5	●	●	●		●	●	●	●				●	●	S12
Sord SWP20	£1,444	Daisywheel		●			●		9600	2000	6,8	10,12,15	16	132	15	66×44.7	22	5	●	●	●	●	●		●	●	●		●		●	S2
Star DP-8480	£251	M		●			+		2400	132	6,12	10,12,16.7	100	132	10.5	39.4×32.4	8.5	2	●			●		●	●	●	●			●	●	S3
Star DP-510	£333,50	M9×9		●	+	+			9600	2,300	6,8	10,12,17	100	132	10	315×392×136	7	3	●	●	●	●	●	●	●	●	●		●	●	●	M7
Star DP-515	£460	M9×9		●	+	+			9600	2,300	6,8	10,12,17	100	233	15	515×542×136	10	3	●	●	●	●	●	●	●	●	●		●	●	●	M7
Systime Systerm	£1,909	M					●		9600	256	6,8	10	120	132	16	71.7×61	53	6			●		●		●	●	●		●			S4

Systime Sysprint-P	£1,714	M		●					9600	256	6,8	10	150	132	16	71.7×61	50	6			●		●	●	●			●		S4
Systime Sysprint-S	£1,599	M				●			9600	256	6,8	10	120	132	16	71.7×61	53	6			●		●	●	●			●		S4
Tandy TRS 80 DW2	£1,299	Daisywheel		●					9600	2000	6	10,12	43	163	16.5	62.4×20.4	27	4	●	●	●	●			●	●		●	●	T1
Texas Instruments 743	£1,271	Thermal 7×5				●	●		300	N/A	6	10,17	30	80	8.5	39.1×40.6	6	1									●			D5
Texas Instruments 745	£1,470	Thermal					●		300	256	6	10,17	30	80	8.5	39.1×40.6	13.5	1									●			R1
Texas Instruments 781	£1,259	Thermal 7×5				●	●		9600	256	6	10,17	120	80	8.5	40.6×15.24	8.5	1						●	●				●	D5
Texas Instruments 810	£1,369	M 9×7		+		+	●		9600	256	6,8	5,8,10,16.5	150	132	15.5	65.4×50.8	25	9						●	●	●		●		D5
Texas Instruments 820	£1,438	M 9×7				○	○		9600	2000	6,8	5,8,10,16.5	150	218	15.5	64×45.7	40	5						●	●	●		●		D5
Texas Instruments 840	£847	M 9×9				+	●		9600	256	6,8	10,16.5	75	220	15	57.6×43.2	11.3	3						●	●	●	●	●	●	R1
TRD 170S	£834	Daisywheel		○			○		19200	256	6	10,12,15	17	132	15.5	50.8×33	13	6	●	●	●	●		●	●	●			●	T2
Toshiba T1350	£1,898	M		○			○		9600	256	6	10,12	192	192	15	55×38	19.9	3	●	●	●	●	●	●	●	●	●	●	●	T4
Walters WM2000	£477	M 9×9	+	●	+	+			19200	750	6,8,12	5,6.6,8.3,10,13.3,16.6	128	132	10	43.9×33.5	12	4	●	●	●		●	●	●	●		●		W1
Walters WM4000	£713	M 9×9	+	●	+	+			19200	1500	6,8,12	5,6.6,8.3,10,13.3,16.6	150	220	15	63×39	13	5	●	●	●		●	●	●	●		●		W1
ZX Printer	£40	Electrical						1	N/A	N/A	9	32	50	32	4	14×4.6	N/A	1			●		●	●			●		●	S5

MONITORS

These have been split into **colour** and **monochrome.**

Screen size is a diagonal measurement in inches. Nearly all monochrome monitors accept a **composite video** signal from the computer and most computers are equipped with composite video output. Colour monitors feature a wider range of **signal** systems than mono and it is important to match the output of your computer to the input of the monitor.

An **audio channel** will enable sound to be output from a speaker inside the monitor. **Mono tint** refers to the colour of the text on a mono monitor. Some monitors come with an **anti-glare filter** to relieve operator discomfort.

Band width refers to the frequency range of signals to which the monitor can respond in MegaHertz. **Dot resolution** indicates the number of dots which can be displayed across the screen: the more dots, the sharper the picture.

Dimensions indicates the area the unit occupies on the desktop.

COLOUR MONITORS

Make & Model	Price inc VAT	Screen size (in inches)	Signal: Modulated PAL	Signal: Unmodulated PAL	Signal: TTL RGB	Signal: 75 Ohm linear	Signal: 32 bit 4 bit TTL	Audio channel	Anti-glare filter	Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
Crofton C1401	£300	14			●					10	600	37×42	10	C4
HM 2713	£3,120	13			●					25	720	54×40	36	B1
HM 2719B	£2,553	19			●					25	960	50×49	46	B1
HM 2719C	£3,042	19			●					25	960	50×49	46	B1
HM 3619	£3,548	19			●					45	1280	50×44	48	B1
Kaga Vision II	£327.75	12			●				●	15	510	32×30.3	12.5	D6
Lion Cub 1431-TTL	£286	14			●					7	585	65×57.5	11.5	S6
Lion Cub 1436	£316	14					●			7	585	65×57.5	11.5	S6
Lion Cub 1439	£339	14				●				7	585	65×57.5	11.5	S6
Lion Cub 1441-TTL	£546	14			●					15	585	65×57.5	11.5	S6
Lion Cub 1445	£633	14				●	●			15	895	65×57.5	11.5	S6
Lion Cub 1449	£604	14				●				15	895	65×57.5	11.5	S6
Lion Cub 1451-TTL	£430	14			●					10	653	65×57.5	11.5	S6
Lion Cub 1455	£483	14				●	●			10	653	65×57.5	11.5	S6
Lion Cub 1459	£459	14				●				10	653	65×57.5	11.5	S6
Lion Cub 2031-TTL	£344	20			●					7	585	65×57.5	11.5	S6
Lion Cub 2035	£431	20				●	●			7	585	65×57.5	11.5	S6
Lion Cub 2036	£390	20					●			7	585	65×57.5	11.5	S6
Lion Cub 2039	£371	20				●				7	585	65×57.5	11.5	S6
Lion Cub 2051-TTL	£646	20			●					10	940	65×57.5	11.5	S6

Make & Model	Price inc VAT	Screen size (in inches)	Signal: Modulated PAL	Signal: Unmodulated PAL	Signal: TTL RGB	Signal: 75 Ohm linear	Signal: 32 bit 4 bit TTL	Audio channel	Anti-glare filter	Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
Luxor Digital	£574	14			●			●	●	25	800	N/A	15.7	P1
Luxor Linear I	£597	14				●		●	●	25	800	N/A	15.7	P1
Luxor Linear II	£643	14			●			●	●	25	800	N/A	15.7	P1
Microtech 14	£402	14		●	●		●			18	585	33.7 × 40.8	12.6	M6
TM 22	£329	6					●		●	5.5	N/A	22×34.5	4.1	J3
VM 14 PSN	£378	14					●		●	5.5	300	47×40	13.6	J3
Wolf Cub 1435-TTL	£358	14					●	●		7	653	65×57.5	11.5	S6
Wolf Cub 1446-TTL	£587	14						●		15	895	65×57.5	11.5	S6
Wolf Cub 1456	£454	14						●		10	653	65×57.5	11.5	S6

MONOCHROME MONITORS

Make & Model	Price inc. VAT	Screen size	Composite video	Audio channel	Mono tint	Anti-glare filter	Band width (MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
AVT DM 210G	£138	12	●		Green	●	12	750	30.8×29.6	9.5	L1
EG 100	£77	12	●		Green		8	700	37.5×29	8	L1
EG 101	£91	12	●		Green		12	700	37.5×29	8	L1
LEDM 091D	£99	9	●		B&W	●	12	750	22×24	5.4	L1
LEDM 0910	£121	9	●		Green	●	12	750	22×24	5.4	L1
Luxor 10	£212	10	●		Orange	●	22	625	N/A	8	P1
Luxor 15	£283	15	●		Orange	●	22	625	N/A	13	P1
M9	£131	9	●		Green		15-22	650	22.4×25.7	5.7	P1
M12	£144	12	●		Green		15-22	800	29.3×30	9.3	P1
Novex	£114	12	●		Green		12	750	N/A	N/A	P1
N12 1003	£112	12	●		Green		24	800	23×26.5	7	P1
Prince	£126	12	●		Green		24	800	33×50	7	C4
PM 102	£126	9	●		Green	●	24	800	22×28	7	C4
PM 1201	£138	12	●		Green		24	800	33×50	7	C4
Zenith ZVM121*	£99	12	●	●	Green	●	15	N/A	29×29	6.5	P2
U300	£149	12	●		Green	●	18	N/A	34·8×36·8×29·2	7·7	R4
U300A	£153	12	●		Amber	●	18	N/A	34·8×36·8×29·2	7.7	R4

DISK DRIVES

This section is divided into categories covering 5¼in and 8in floppy disks.

Disk data **capacity** is measured in kilobytes (K): one kilobyte = 1,024 characters. A **no of disks** column is included because some disk units contain two disk drives.

Manufacturers can vary the number of disk data **tracks** and these are divided into sectors. This **sectoring** system allows the information to be stored and retrieved by reference to a timing mark on the disk so the computer can keep track of its rotation. The system can be hard, where reference is kept by a hole in the disk, or soft, where the disk position is monitored by magnetic signals.

Some drives have one read/write head for each side of the disk so the buyer has a choice between **single or double-sided** drives. **BS** means that the drives are both single and double-sided.

As disk technology advanced it became possible to cram more data onto the floppy so drives will feature either **single or double** (data) **density**. **BD** means that the drives are both single and double density.

The interface acts as an interpreter so the computer and disk can exchange information. Each device must have the same interpreter before a useful cable connection can be made. The **connect to** column allows you to match the disk interfaces to those included in the disk drives or available at extra cost.

5¼" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
Apple II	£399	143K	1	35	16	SS.SD				●						P2
Atari	£299	90K	1	40	Soft	SS.SD									●	A4
BASF 6106	£195	500K	1	48	Both	SS.BD					●					B6
BASF 6108	£240	500K	1	48	Both	DS.BD					●					B6
BASF 6118	£279	1Mb	1	96	Both	DS.BD					●					B6
Canon X8300	£600	640K	2	80	Soft	DS.DD									●	C5
CD 40	£679	400K	2	40	Both	SS.BD									●	C6
CD 50A	£424	500K	2	40	Both	SS.BD					●					C6
CD 50E	£569	1Mb	2	80	Both	SS.BD					●					C6
CD 50F	£712	2Mb	2	80	Both	DS.BD					●					C6
CD 80	£765	800K	2	80	Both	SS.BD									●	C6
CD 80D	£949	1.6Mb	2	80	Both	DS.BD									●	C6
Commodore 2031	£454	171K	1	35	Soft	SS.DD	●									C2
Commodore 4040	£799	343K	2	35	Soft	SS.DD	●									C2
Commodore 8050	£1,029	1Mb	2	77	Soft	SS.DD	●									C2
Commodore 8250	£1,489	2Mb	2	154	Soft	DS.DD	●									C2
Commodore VIC 1541	£345	171K	1	35	Soft	SS.DD									●	C2
Control Data 9408	£221	250K	1	40	Both	SS.BD					●					C7
Control Data 9409	£272	500K	1	40	Both	DS.BD					●					C7
Control Data 9409T	£420	1Mb	1	80	Both	DS.BD					●					C7
Control Data ZL141	£225	250K	1	40	Both	SS.DD			●							M5
Control Data ZL141B	£175	250K	1	40	Both	SS.DD			●							M5
Control Data ZL142	£360	500K	2	40	Both	SS.DD			●							M5
Control Data ZL241B	£240	500K	1	40	Both	DS.DD			●							M5
Control Data ZL291	£380	1Mb	1	80	Both	DS.DD			●							M5
Control Data ZL291*	£405	500/1Mb	1	40/80	Both	DS.DD			●							M5
Control Data ZL291B	£320	1Mb	1	80	Both	DS.DD			●							M5
Control Data ZL292	£640	2Mb	2	80	Both	DS.DD			●							M5
CS 40	£482	200K	1	40	Both	SS.BD									●	C6
CS 50A	£229	250K	1	40	Both	SS.BD					●					C6
CS 50E	£305	500K	1	80	Both	SS.BD					●					C6
CS 50F	£397	1Mb	1	80	Both	DS.BD					●					C6
CS 80	£523	400K	1	80	Both	SS.BD									●	C6
CS 80D	£627	800K	1	80	Both	DS.BD									●	C6
Cumana AS100	£252	200K	1	35	Soft	SS.BD				●						C6
Cumana DA8035	£857	655K	2	80	Soft	SS.BD				●						C6
EG 401AT	£370	102K	2	40	Soft	SS.BD					●					L1
Gemini 825	£403	400K	1	80	Soft	SS.DD						●				G2
Gemini 825	£518	800K	1	160	Soft	DS.DD						●				G2
Gemini 825	£661	800K	2	80	Soft	SS.DD						●				G2
Gemini 825	£776	1.6Mb	2	160	Soft	DS.DD						●				G2
Lowe EG 400AT	£426	200K	2	40	Soft	SS.BD					●					L1
Lowe EG 400T	£253	102K	1	40	Soft	SS.BD					●					L1
M 4853	£311	1Mb	1	80	Soft	DS.DD					●					A3
M 4854	£368	1.6Mb	1	77	Soft	DS.DD					●					A3
Megastore MIOS	£1,034	1.2Mb	2	80	Soft	DS.DD				●					●	V1
Multi Floppy Drive	£592	8Mb	5	770	Soft	SS.DD	●									H1
RM MDS-1	£1,950	144K	1	40	Soft	DS.SD		●							●	R3
RM MDS-2	£2,147	288K	2	40	Soft	DS.SD		●							●	R3
Scorpio 8	£863	8Mb	5	770	Soft	SS.DD	●									H1
Sharp MZ80 FB	£856	560K	2	70	Soft	DS.DD									●	S7
Tandy Colour	£449	175K	1	40	Soft	SS.DD									●	T1
Tandy 26-1160	£299	75K	4	40	Soft	SS.SD					●					T1
Tandy 26-3023	£299	156K	4	35	Soft	SS.DD					●					T1
Tandy Model 1	£389	90K	1	35	Soft	SS.SD									●	T1
Tandy Model 111	£369	175K	2	40	Soft	SS.DD									●	T1
TM 101-4	£282	1Mb	1	160	Soft	SS.DD	●									H1
TM 102-2	£393	2Mb	1	160	Soft	SS.DD	●									H1
TM 848-1	£389	800K	1	77	Soft	SS.DD	●									H1
TM 50-1	£147	250K	1	40	Soft	SS.DD	●									H1
TM 100-1	£158	250K	1	40	Soft	SS.DD	●									H1
TM 100-2	£221	500K	1	80	Soft	DS.DD	●									H1
TM 100-4/4M	£247	1Mb	1	160	Soft	DS.DD	●									H1
Tracker 1	£373	1Mb	2	80	Soft	SS.DD					●					D7
Tracker 2	£497	2Mb	2	80	Soft	DS.DD					●					D7

8" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of discs	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
ACP 700 (AC)	£293	1Mb	1	77	Soft	DS.DD									●	E2
ACP 750 (DC)	£316	1Mb	1	77	Soft	DS.DD									●	E2
ACP 1500 (DC)	£403	2Mb	1	77	Soft	DS.DD									●	E2
Caldisk 142M	£465	500K	1	77	Both	SS.BD									●	E2
Caldisk 143M	£522	1.2Mb	1	77	Both	DS.BD					●					F1
Caldisk 143M-1	£465	500K	1	77	Both	SS.BD					●					F3
Commodore 8280	£2,760	987K	2	77	Soft	DS.DD	●									C2
Canon X 8330	£1,200	2Mb	2	153	Soft	DS.DD									●	C5
Control Data 9404B	£684	800K	1	77	Both	SS.BD					●					M5
Control Data 9406-4	£1,144	1.6Mb	1	77	Both	DS.BD					●					M5
Eicon FD8/1D/DD	£1,438	1Mb	1	77	Soft	SS.DD				●						E3
Eicon FD8/1D/SD	£1,397	500K	1	77	Soft	BS.SD				●						E3
Eicon FD8/2D/FBR	£1,740	1Mb	2	77	Soft	DS.SD									●	E3
Eicon FD8/2D/DD	£2,013	2Mb	2	77	Soft	SS.DD				●						E3
Eicon FD8/2D/SD	£1,972	1Mb	2	77	Soft	SS.SD				●						E3
Eicon FD8/1D/FBR	£1,240	500K	1	77	Soft	DS.SD									●	E3
F 311	£1,725	1.2Mb	2	76	Soft	DS.SD									●	B5

8" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to: I.FEE	RS232	BBC	Apple II	St. Shugart	Nuabus	Gemini	20ma	Others	Distributor
F 320	£2,300	2.4Mb	2	76	Soft	DS.DD									●	B5
M 2894	£499	1.6Mb	1	77	Soft	DS.DD					●					A3
M 2896	£493	1.6Mb	1	77	Soft	DS.DD					●					A3
Megastor 11 DD	£1,133	2Mb	2	77	Soft	DS.DD				●						V1
Megastor 11SD	£1,018	1Mb	2	77	Soft	DS.SD				●					●	V1
Megastor 111	£1,121	2Mb	2	77	Soft	DS.DD				●					●	V1
R.M. FDS-2	£3,789	1Mb	2	77	Soft	DS.SD	●								●	R3
Tandy Model 11	£999	486K	1	77	Soft	DS.SD.									●	T1
Tandy Model 16	£949	1.2Mb	1	77	Soft	DS.DD									●	T1
Tandy Model 16	£1,549	2.5Mb	2	77	Soft	DS.DD									●	T1

MODEMS

A modem interfaces a computer and the telephone system so computers can communicate over long distances. It converts data to electrical pulses or sounds that can be sent down the line. A modem can be connected to the line directly or acoustically. A **D** in the **connection** column represents direct link, while **A** indicates acoustic. The acoustic coupler is like a female telephone handset with a speaker in the coupler opposing the phone's mouthpiece and a microphone opposing the earpiece. A **B** in this column indicates that both methods of attachment are available. **Baud** rate shows the speed with which the data is transmitted.

The modem must be connected to the computer through an interface. The **interface** column lists the main interfaces featured on each modem. **Asynchronous** means that data may be transferred at intervals as available or as needed. **Synchronous** data is transmitted at regular intervals. **Simplex** transfers data in one direction, while **Half duplex** can transmit/receive in either direction, but not simultaneously. **Full duplex** transmits and receives information in both directions at once. Some modems can **originate** a call or start a two-way conversation. **Answer** means they can respond to a call from another computer.

Make and Model	Price inc VAT	Connection	Data Rates (baud)	Interface	Others	Capabilities: Asynchronous	Synchronous	Simplex	Half Duplex	Full Duplex	Originate	Answer	Distributor Code
AD 1223	£287.50	D	1200	RS232		●			●		●	●	A6
AJ 311	£320	B	300	RS232		●			●	●	●	●	A5
AJ 1222	£736	D	1200	RS232		●	●		●	●	●	●	A5
AJ A211	£263	A	300	RS232		●			●	●	●		A5
AJ 1234	£684	A	1200	RS232		●	●		●		●		A5
AJ 1256	£684	B	1200	RS232		●	●		●	●	●	●	A5
AM 211	£387	B	300	RS232		●			●	●	●		A5
Bermac 1200/1 Model A	£414	D	1800	RS232			●			●		●	B3
Bermac 1200/1 Model B	£460	D	1800	RS232			●			●		●	B3
CCITT CAT	£228	A	300	RS232/V24			●			●	●	●	D8
CDSV22	£719	D	1200	RS232/V24			●	●			●	●	D8
DSL2123	£329	D	300/1200	RS232/V24			●			●	●	●	D8
Sendata 700 Series A	£253	A	300	RS232, 20ma	1		●				●	●	B4
Sendata 700 Series B	£224	A	300	RS232, 20ma	1		●				●	●	B4
Sendata 700 Series C	£309	A	600-1200	RS232, 20ma	1		●			●		●	B4
Sendata 700 Series D	£309	A	75-1200	RS232, 20ma	1		●				●	●	B4
Sendata 700 Series E	£149	A	300-1200	RS232, 20ma	1		●		●			●	B4
Racal 126 LS1	£782	D	2400	V24				●			●	●	R2
Racal MPS 3021	£295	D	300	V24			●				●	●	R2
Racal MPS 1222	£678	D	1200	V24			●	●			●	●	R2

PLOTTERS

Plotters use a pen to put graphics or characters on paper under the command of a computer. They are usually one of two types—flatbed or drum. A **flatbed** holds the paper flat while the pen draws on it in two dimensions. A **drum** plotter turns the paper vertically on a cylinder while the pen moves horizontally. Most plotters can change pens during operation so a variety of colours and line thicknesses are available. **Max pens** indicates the number of pens in operation or on standby. Dimensions of the paper to be used are listed under **paper size. Maximum plotting speed** measures the distance in millimetres per sec covered by the pen. **Interfaces** are included in the basic price or come at extra cost.

Make and Model	Price inc VAT	Type	Max Pens	Paper Size	Maximum Plotting Speed in secs.	Interface (+ at extra cost)	Distribution
Calcomp 81	£3,392	Flat	8	A3	30cm	RS232 or IEEE	C3
DXY 100	£699	Flat	1	A3	7	Centronics	R4
HP 7470A	£1,317	Drum	2	A4	38.1cm	RS232 (IEEE+)	H2
PD4	£585	Flat	1	A4	700mm	(IEEE+)	J2
RY-21	£747.50	Flat	1	A4	200mm	Centronics, (RS232+)	R5
RY-10MZ	£1,865	Flat	8	A3	400mm	Centronics, (RS232, IEEE+)	R5
Strobe 100	£662	Drum	1	A4	7.6cm	(RS232, Parallel+)	D6
TRS-80 Pen Plotter	£1,399	Flat	6	A4	6.8cm	RS232	T1
Watanabe WX 4634	£2,515	Flat	2	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4635	£2,301	Flat	1	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4637	£2,862	Flat	2	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4638	£2,635	Flat	1	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4671	£1,129	Flat	1	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4675	£1,638	Flat	6	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4731	£1,761	Drum	4	A3	200mm	(Centronics, RS232, IEEE+)	E4

DISTRIBUTORS

A1 Appropriate Technology, 01-625 5575 **A2** Advent Data Products, Melksham 706289 **A3** Altex Microcomputers Ltd, Reading 791579 **A4** Atari International (UK), Slough 33344 **A5** Anderson Jacobson Ltd, Slough 25172 **A6** Alpha Datasystems, 058 27 66136

B1 Bytech, Reading 61031 **B2** British Olivetti, 01-785 6666 **B3** Barron McCann, Biggleswade 316286 **B4** Bencom Sendata (UK), 01-940 1386 **B5** Baydel Ltd, Leatherhead 378811 **B6** BASF, 01-388 4200

C1 Centronics, 01-581 1011 **C2** Commodore Business Machines, Slough 79292 **C3** Calcomp Ltd, Bracknell 50211 **C4** Crofton Electronics, 01-891 1923 **C5** Canon (UK) Ltd, 01-680 7700 **C6** Cumana, Guildford 503121 **C7** CBL, Reading 792097

D1 Discom, Evesham 3591 **D2** Datatrade Ltd, Northampton 22289 **D3** DNCS Ltd, 061-643 0016 **D4** DRG, Weston-super-Mare 415398 **D5** Data Systems Division, Bedford 223889 **D6** Data Efficiency, Hemel Hempstead 63561 **D7** Data Track Technology, New Milton 619650 **D8** Dacom Systems, Milton Keynes 676797

E1 Epson (UK), 01-900 0466 **E2** Elecomatic, 041-881 5825 **E3** Eicon, Barhill 81825 **E4** Environmental Equipments Northern Ltd, Nantwich 625115

F1 Fastcol, Reading 791557

G1 Geveke Electronics, Woking 26331 **G2** Gemini Micros, Amersham 28321

H1 HAL Computers Ltd, Farnborough 517175 **H2** Haywood Electronic Asoc. Ltd, 01-428 0111

I1 Informex Ltd, 01-318 4213 **I2** Intac Data Systems, Rotherham 547170 **I3** ITT Business Systems, Brighton 507111 **I4** ITT Consumer Products, Basildon 3040 **I5** Intelligent Interfaces, Stratford-upon-Avon 296879

J1 Jones & Brother, 061-330 6531 **J2** J J Lloyd Instruments, Lockseath 4221 **J3** JVC, 01-450 2621

L1 Lowe Electronics, Matlock 4995

M1 Mitsui & Co Ltd, 01-600 1777 **M2** Modata, Tunbridge Wells 41555 **M3** Mannesmann Tally Ltd, Reading 788711 **M4** Micropute, Macclesfield 615384 **M5** Microware, 01-272 6237 **M6** Microtech Leeds, Leeds 679964 **M7** Micro Peripherals Ltd, Basingstoke 3232

N1 Newbury Data Recording, Newbury 48864

P1 Phoenix Technology, 01-737 3333 **P2** Pete & Pam Computers, Rossendale 227011

Q1 Qume (UK) Ltd, Reading 584646

R1 Rair Ltd, 01-836 6921 **R2** Riva Terminals, Woking 71001 **R3** Research Machines Ltd, Oxford 249866 **R4** Roland (UK) Ltd., 01-568 4578 **R5** Rikadenki Mitsui Electronics, 01-397 5111

S1 Sintron Electronics, Reading 875464 **S2** Sord, 01-930 4214 **S3** Stotron, Coventry 613521 **S4** Systime, Leeds 702211 **S5** Sinclair Research, Camberley 681666 **S6** Silicon Express, Leicester 374917 **S7** Sharp Electronics, 061-205 2333 **T1** Tandy Company, Walsall 648181 **T2** Triumph Adler, 01-250 1717 **T3** Technology For Business, 01-837 1271 **T4** Toshiba Office International, Sunbury-on-Thames 85666 **V1** Viasak, High Wycombe 448633 **W1** Walters Microsystems Int Ltd, High Wycombe 445175 **X1** X-Data Ltd, Slough 723331 **Z1** Zygal Dynamics, Bicester 3361

MZ-80K Computers plus twin disks, 1/0 box, printer interface card, 25 disks, 300 programs, toolkits, Wordpro, Zen, many extras. £850 ono 01-690 6676.

Osborne 1 micro CP/M based single density with Wordstar, Supercalc, Basic and software as new. £500. 01-439 9710.

Acornsoft Planetoid for BBC, will swop for Super Invaders or any good model B game, alternatively will sell for £7.50. Tel: After 5pm 061-428 9707.

Sharp cassette recorder, Sinclair compatible, very reliable, selling it because I've got another, bargain at £8, costs £30 new. Tel: 061 428 9707 after 5pm.

Atari 400 16K, Atari Basic cartridge, manual, etc. Five months old, as new, cost £250, only £125. Tel: Bournemouth (0202) 517342 evenings.

Acornsoft Lisp wanted in exchange for Acornsoft Forth cassette. Tel: 078 18 8423.

Texas TI99-4/A, one week old, hardly used, still boxed. Bargain price, £125 ono. Clive Newton, 371 Llantarnum Road, Cwmbran, Gwent, South Wales.

ZX81 32K mounted in case with moving keys, Q save and some software, £100 ono or swop for Acorn Atom. Mr Hutt, Lingmell, St. Bees, Cumbria CA27 0ED.

UK101 8K 1/2MHz 600/2400 Baud UKmon 2, new Basi/4 sturdy case, disassembler, various programs PSG Board, £100 ono. Bourne End (Bucks). Tel: 062-85 25019 (evenings).

Atom owners. Software wanted for Acorn Atom, also, expansion hardware. Tel: Rainham (Essex) 22950 after 6.30pm or weekends.

Intellivision, speech synthesis, 17 cartridges, will sell separately, console £75, speech £25, cartridges £10 each or the lot for £200. All boxed, excellent condition. Tel: 051-339 0534.

Oric 48K as new with less than 10 hours' use, boxed with all leads and manual, 12 months guarantee, £150, save £20 on shop price. Tel: (0484) 605558.

New Brain ad, six months old, hardly used, includes printer lead, offers around £210. 0742 588058.

UK 101 8K, 1-2 MHz, 300/600 baud, cased, no-monitor, toolkit, joysticks, mini Eprom board, programmable sound generator, assembler, dissassembler, lots of software inc Supertrek, £100 ono. Bradford 727635 before 7pm.

16K ZX81 with full sized moving keyboard plus £20 of software and lots of books, £80 ono. Tel: (04562) 230 (evenings).

Texas TI99/4A personal computer 16K RAM, cassette cable, joysticks, two cartridges, 35 program cassette, (£5 separately). Basic Teacher cassette, bargain, hardly used, only £175 ono. Borland, 51 Lovell Gardens, Watton, Thetford, Norfolk IP25 6ZX.

Acorn Atom 12K + 12K power pack, manual, Atom Magic Book, Invader tape, excellent condition, £100 ono. Tel: Leeds 563575 after 6pm.

BBC B 1.2OS 1½ months old still in box, cassette lead, welcome tape, user guide, £365 ono. Tel: Lancing 764172.

Sinclair ZX81 + 16K RAM pack, all leads + power pack cassette recorder, software including 3D Monster Maze £70, 3 months old. 26 Kennet Road, Tidworth, Hants SP9 7NT.

Wanted ZX81 1K, will pay up to £10, also if ZX81 bought then RAMpack wanted, will pay £10, both must be in good condition. Tel: Bobby, Bradford (0274) 495882 5pm, weekdays.

Starlord (25,101) players, make diplomatic contact, Join Alliance? Non-players wanting information about this play-by-mail game, (s.a.e.) P. Moreland, Flat C, 4 Hedgegate, Powis Terrace, London W11.

ZX81, 16K, Maplin keyboard, plenty of great software, as new, must sell, bargain at £80. Tel: Horley 71534, buyer collects.

PCN Billboard

Why wait? Buy my 48K Oric-1 Micro, including lots of quality software, only two months old, sell for £150 ono. Tel: 66-72793 or 01-633 3771.

BBC Model B, 100K disk drive CRT80A cassette recorder, 10 inch B/W monitor, joysticks, software on disk, tape, + books, £700. Tel: Newent, Glos (0531) 821634 evenings.

Atari VCS including 16 cartridges open to offers over £280. Tel: 01-593 7700 after 4 pm weekdays or weekends, ask for Rod.

T199/4A cassette software (Extd Basic), Pesterods, Space Rescue, Octal-1, Keys of the Castle, Data Rescue, Attack Man, Battlefront, Frogger, on original cassettes, £5 each. Tel: Rugby 890 760.

Texas Logo software with manual £58, Terminal Emulator II £38, Securities Analysis £24, will consider trades. Tel: 01-643 9958.

Swop three month old Zonx-81 sound generator plus £20 of great software (large selection) for your ZX-printer. 14 Stivchall Croft, Coventry, CV3 6GN.

ZX81 includes 16K RAM pack and two tapes etc worth £85, selling at £50, 19 Stone Hall Avenue, Redbridge, Essex. Tel: 554-6034, excellent condition.

Dragon 32K four months old, with joystick, and Donkey King & Planet Invasion software + two good books, brand new £217, bargain at £165 ono. Tel: 0252 544877.

BBC software to swop, Acornsoft, Salamander, Program Power, A & F, and many more, call Ezra (evening). Tel: 01-458 6440.

Acorn Atom, 1/2 MHz 12K RAM 12K ROM, 6522 and FP Rom, printer interface, all manuals and leads, software includes Frogger, Galaxians, Pacman, Invaders, Space Panic, Defender, Zodiac etc, will sell £100. Tel: 0487 841064.

Monitor 23in Pye B/W, £35 ono, buyer collects. Tel: 0477 35938 Cheshire.

Wanted penfriend with ZX81 or ZX Spectrum. Write to Daryl Ward, 3 Newbury Close, Weston, Leicester LE8 2JJ.

G700 Philips Video game, three cartridges, Skiing, Satellite Attack and Lazer Wars, worth £100, swop for ZX81 with 16K and about five games on tape. Tel: Halifax 822194, Darran.

Vic20 cassette unit joystick plus £190 software including Buti, Sarjon II, Chess, Vic men, Machine code Monitor, Rabbit's Skramble and Myriad, £175 Tel: Skelmersdale (0943) 25652.

Atom disk pack controller card 4K/DOS 3K/static includes DOS ROM and nine I/C, left after BBC upgrade £40. Booth, 23 Andrews Lane, Formby, Liverpool.

Atari 400/800 Missile Command cartridge, swop for Star Raiders cartridge or Zaxxon cassette (16K). Andrew, 15 Ashbourne Road, Keighley, W Yorks, BD21 1LB. Tel: 0535 604005.

TRS-80 Model I level II interface 32K two disk drives, Scripsit WP Visicalc, Tandy Mail disks, manuals, books £950 or exchange for Obsorne 1, similar software. Tel: 021-350 7193 before 6 pm W. D. Dawson.

Unwanted Spectrum software, Time Gate (48K), Golf (16K), Transylvanian Tower (48K) £8 ono. J Webster, Crafton, Cord Lane, Easenhall, Nr Rugby CU23 0HZ. Tel: Rugby 833116, urgent.

BBC software to swop including Acornsoft, Program Power, IJK, Bugbyte and A+F, also Acornsoft originals for sale, eg, Forth, Billiards, Missile Command and a few others. Tel: 01-574 4122.

Spectrum Micro Power add-on (with Atari joystick port) + joystick kit (assembled), £20 ono. J Mason, Cross House, Carperby, Leyburn N. Yorks DL8 4DQ. Tel: Aysgarth 457 after 4.30.

ZX81 software for sale — 3D Monster Maze, Catacombs, Breakout, Invaders, Scramble, Defender, Gulp and Invaders/Bomber, £2.50 each. Tel: Kingswinford (0384) 278812.

Swop Intellivision and Intellivoice with nine cartridges for Atari 400 with Basic and cassette or will sell for £150. Tel: Burton-on-Trent 701042.

Atari VCS plus five cartridges, wanted £100 ono. Tel: Stoke-on-Trent 504278 after 5 pm, weekdays, anytime weekends.

Sinclair ZX81 16K with power pack, manual leads cassette player, games software mags, £70. Hubbard, 4 Glebe Rise, Kings Sutton, Banbury Oxon. Tel: 0295 811604.

Atari cartridges, Missile Command £14, Warlords £10, Super Breakout £12, or the lot for £30. Tel: 0738 21871.

Atari 400/800 32K back-up most boot disks, including bad sectors. Also copies most boot cassettes £15.95. Anthony Roberts, 16 Hambledon Crescent, Cottesmore, Oakham, Leicester. Tel: 0572 812851.

Colour Genie software, Kansas's Chomper and Cosmic Attack, Mysterious Adventure Number 2, Time Machine, cost £30, asking £17, will split £6.50 each. Tel: Minety 207 (evenings).

Le Stick £12, Atari VCS cartridges Laser Blast £6, Star Voyager £10, Combat £4, all in excellent condition. Tel: Spen, Medway 61406 after 6 pm.

Video Genie 16K + Computer Monitor + £70 of software + £50 of manuals, leads, magazines, together worth £450, will swop for 48K Oric or sell for £250. Tel: 01-857 4501, Dave.

Atari VCS + eight cartridges £120 (collect only) or swop for 48K Spectrum. 60 Nook Lane, Golborne, Nr Warrington Lancashire WA3 3JW.

Required Eprom programmer for Pet CBM at reasonable price, Tel: Richard, Sheffield 0742 25596.

Acorn Atom 12K + 12K, BBC Basic Board, two utility ROMs + software, good condition, two Atom books, sell for £210. Tel: Sheffield 0742 339003 after 7 pm.

ZX81 Sinclair 16K, £20 of software, leads etc and magazines, still boxed, £70. ZX81 + keyboard, £10 of software, leads, £40. Tel: 0332 766797.

For sale: 48K and 16K Spectrum tapes including Super Chess, Orbitor, Hobbit and more. Tel: Lymington 683396 after 5pm.

Wanted: Sinclair ZX printer. Tel: Richard, 080428-321 after 5.30pm.

Half price Commodore 64 software for sale or swop: Frogger £3.50, Camels £4.25, Startrek £3.50, Graverobbers £3, Centropods £3. Tel: 54 66855 (Waterlooville) after 6pm.

Sinclair ZX81 + 16K RAM pack + one Memo Tech, light professional keyboard, all brand new with guarantee, software included, £100. Owner bought new system. Tel: Sampson, 01-472 6489.

BBC Software to sell or swop, including Acornsoft, Program Power, Level Computing, IJK, A+F software etc. Tel: 01-808 8906 after 6pm.

Vic20, sell 3K RAM pack, plus Frog (game), plus intro to Basic Part 1, the lot, £33 ono or may sell separately. Tel: 584 1648 (London). Giles or Yves after 7pm.

Colour cartridge TV game, four cartridges, joysticks, only £25. Tel: Erith (38) 34749 (after 6pm).

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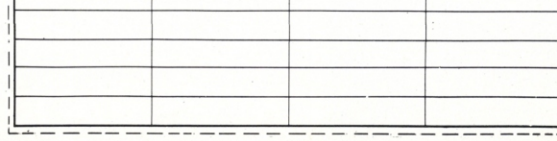

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Sea and silicon

You may have read in *PCN* last week that Atari has plans to unload its old 400 and 800 series computers on to computer camps.

Well, if *Time* magazine is to be believed, Atari is unloading some of the machines on a very special kind of camp — the Club Med.

The American magazine's Computer section this week features a picture of a scantily-clad young Club Med vacationer sitting on a deckchair plunking away at an Atari 800.

The Atari on the beach is part of the extra service offered in one of the Club Med's new sun and silicon chip holidays at up-market computer camps for the jet-set. So if you see keyboards among the cabanas on your favourite beach this year, take comfort from the knowledge that the Club Med set is using machines they don't even know are obsolete.

Mix me an Old Fashioned, Antonio!

NEXT WEEK

- ***Hardware*** **— The Microtan DIY micro; old solderers never die.**
- ***Software*** **— Write your own language for the BBC with BCPL.**
- **— All you need to know about adventure programming.**
- ***Peripherals*** **— TI for the memory; how to use mini-memory modules on the 99/4A.**
- ***Micropaedia*** **— Commodore 64, part 2.**

SYNTAX ERRORS

Professional foul

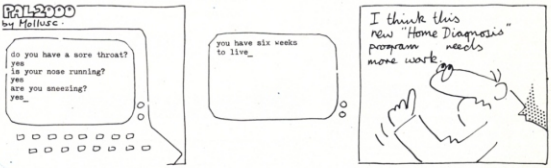
Last week we reported Midlectron's claim to have the first interface that will let you hang an Epson printer off a DEC Professional. That wasn't strictly accurate, as RTZ Computer Services has pointed out to us; RTZ's financial planning package Pro-FPS-80 has been supplied with such an interface for the past three months. Can anybody out there outdo that?

Cowboys at the keyboard

Big Brother stuff from Norton, Ohio, where microtechnology is being roped in to keep tabs on cows.

A company called Omnitronics Research is selling a system that puts coded tags under the hide of the poor beasts. When the farmer/stockman/cowboy beams low-power radar at them the tags all identify themselves to a portable micro.

This is supposed to help in the early detection of disease by monitoring the cows' temperatures. It also works on pigs, but the first attempts to tag the pigs' ears ended in failure when the other pigs, naturally curious, bit their brothers' ears off.



PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

UK EVENTS

Event	Dates	Venue	Organisers
Computer Open Day	September 1	Draganora Hotel, Leeds	Tony Kaminiski, Couchmead Communications Ltd, 01-778 1102
First Hampshire Computer Fair	Sep 8-9	Southampton Guildhall	Testwood Exhibitions, 33/34 Oxford Street, Southampton, 0703 34020
Video, Audio and Computer Show	Sep 16-18	Bradford Exposition Centre	R. Cooper, J. Wood & Sons Ltd, Bradford 720014
Home Entertainment Show	Sep 17-25	Olympia, London	Montbuild Ltd, 01-486 1951
Computer Open Day Exhibition	September 22	Central Hotel, Glasgow	Couchmead Communications Ltd, 01-778 1102
Microcomputers in Business	Sep 27-29	Warwick University, Coventry	Peter Bubb, 01-892 4422
IWP one-day workshop	Sep 29	City Conference Centre, 76 Mark Lane, London EC3	Quadrilect, 3 Courtfield House, Baldwin Gardens, London EC1, 01-242 8697
Personal Computer World Show	Sep 29-Oct 2	Barbican Centre, London	Montbuild Ltd, 01-486 1951
Computer Fair	Oct 2	The Sir Frederic Osborn School, Welwyn Garden City	R Brown Welwyn Garden City 23367
European Computer Trade Forum	Oct 4-7	NEC, Birmingham	Clapp & Poliak Europe Ltd, 01-747 3131
Computer Open Day Exhibition	Oct 6	Albany Hotel, Birmingham	Tony Kaminiski, Couchmead Communications, 01-778 1102

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Personal Computers & Office Automation Systems Exhibition	Sep 5-8	Amsterdam, The Netherlands	RAI Gebouw BV, Europaplein 2, 1078 GZ, Amsterdam
Australian Computer Exhibition	Sep 13-16	Melbourne, Australia	Riddell Exhibition Promotions PTY Ltd, 166 Albert Road, South Melbourne, Vic 3205
International Peripheral Equipment & Software Exposition	Sep 13-15	Moscone Centre, Anaheim, USA	Cahners Exposition Group SA, 0483 38085
Computex	Sep 20-22	Limerick, Republic of Ireland	SDL Exhibitions, Dublin 763871
Info '83	Oct 10-13	New York, USA	Cahners Exposition Group, 0483 38085

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Sirius 1 Dealer ☐

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NEW RELEASES

THE ULTRA

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This is a PURE arcade game and a must for all you alien zappers! 16 different screens make things really tricky.
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LIGHT CYCLE

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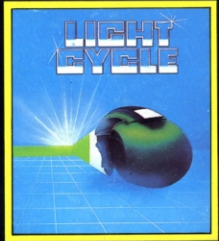

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